

Remedial Action Work Plan

Remedial Action

Area 9/10

**Southeast Rockford Groundwater Contamination
Superfund Site**

Rockford, Illinois

CERCLIS ID No. ILD981000417

SEPTEMBER 2008

Prepared for:

Hamilton Sundstrand Corporation

4747 Harrison Avenue

Rockford, Illinois 61125

Submitted by:



Stantec

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Volume 1 of 2





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VIA FEDEX OVERNIGHT

October 2, 2008

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RE: Hamilton Sundstrand Corporation's Remedial Action Work Plan pursuant to Consent Decree, Civil Action No. 08 C 50129

Dear Mr. Drexler and Mr. Williams:

On behalf of Hamilton Sundstrand Corporation (HS) in accordance with certain requirements set forth in Consent Decree, Civil Action No. 08 C 50129 (CD), Stantec Consulting (Stantec) is submitting the Remedial Action Work Plan documents to the United States Environmental Protection Agency (USEPA) and the Illinois Environmental Protection Agency (IEPA).

This submittal of the Remedial Action Work Plan is made in accordance with Section VI, paragraph 11 of the CD and Section III of the Statement of Work (SOW) and consistent with Section IV of the SOW. The Remedial Action Work Plan includes the following supporting plans as Appendices:

Groundwater Monitoring Plan (Appendix I);
Construction Quality Assurance Plan (Appendix L);
Health and Safety Plan (Appendix M); and the
Contingency Plan (Appendix N).

Per discussion in the meeting of September 30, 2008 between USEPA, IEPA, HS and Stantec, HS plans to continue its Remedial Action (RA) obligations by submitting an Addendum to the previously approved Remedial Design (RD) Quality Assurance Project Plan (QAPP) for review by USEPA, with opportunity for review and comment by IEPA. The Addendum will discuss those activities required for the RA that were not addressed in the RD QAPP. HS and Stantec would like to request that a meeting with the USEPA QAPP review team and IEPA be scheduled for on or around October 17,

Stantec

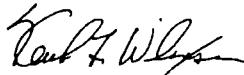
October 2, 2008
RE: HS SER RA Work Plan
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2008 to discuss the content of the Addendum, which may facilitate review of and expedite approval of the document.

Expedited review and approval of the QAPP Addendum is requested based on the intent of HS to complete Phase I activities prior to Jan 2009. This schedule is predicated on the on-going decommissioning and demolition schedule of HS for the western portion of the building in 2009. If Phase I activities cannot be completed prior to January 2009, they will be unable to be completed until July 2009 or later because the proposed investigation activities will occur in the portion of the Facility to be demolished.

We look forward to meeting with the Agencies in the near future, and to your approval of these plans. Please call me at 630-792-1680 to discuss scheduling of the meeting to discuss the QAPP Addendum, or if you have any questions.

Sincerely,
Stantec Consulting



Keith T. Wilcoxson, P.G., CHMM
Managing Principal Geologist

Enclosures: Remedial Action Work Plan
Electronic Deliverable of Enclosures on CD

cc: Mr. Scott Moyer, HS/UTC
Ms. Victoria Haines, HS (electronic deliverable only)



Remedial Action Work Plan

**STANTEC CONSULTING
REMEDIAL ACTION SUPERVISING CONTRACTOR**

**FOR:
HAMILTON SUNDSTRAND
AREA 9/10 SOUTHEAST ROCKFORD GROUNDWATER
CONTAMINATION SUPERFUND SITE**

ROCKFORD, ILLINOIS

SEPTEMBER 2008



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List of Acronyms

1,1,1-TCA – 1,1,1 Trichloroethane
1,1,2-TCA – 1,1,2 Trichloroethane
1,1-DCE – 1,1 Dichloroethene
1,2-DCA – 1,2 Dichloroethane
1,2-DCE – 1,2 Dichloroethene
Acfm – actual cubic feet per minute
ACLs – Alternate Cleanup Levels
AOCs – Areas of Concern
AS – Air Sparge
bgs – below ground surface
CD – Consent Decree
CDM – Camp Dresser McKee
Cfm – cubic feet per minute
cm/sec – centimeters per second
COCs – Constituents of Concern
CQAP – Construction Quality Assurance Plan
CVOCs – Chlorinated Volatile Organic Compounds
DO – Dissolved Oxygen
ESD – Explanation of Significant Differences
Facility – Hamilton Sundstrand Plant #1
FESOP – Federally Enforceable State Operating Permit
FFS – Focused Feasibility Study
FOIA – Freedom of Information Act
FSP – Field Sampling Plan
GAC – Granular Activated Carbon
GMZ – Groundwater Management Zone
HDPE – High Density Polyethylene
Hp - horsepower
HRC-X – Hydrogen Release Compound Extended Release Formula
HS – Hamilton Sundstrand Corporation
IAC – Illinois Administrative Code
IC – Institutional Control
IEPA – Illinois' Environmental Protection Agency
lbs – pounds
LUST – Leaking Underground Storage Tank
MC – Methylene Chloride
MCL – Maximum Contaminant Level
ml - milliliter
MNA – Monitored Natural Attenuation
MSL – Mean Sea Level
MT3D – Modular 3-D Transport Model
NAS – Natural Attenuation Software
NEMA – National Electrical Manufacturer's Association

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ORP – Oxygen Reduction Potential
OSA – Outside Container Storage Area
OU – Operable Unit
PCE – Tetrachloroethene
PDI – Pre-Design Investigation
PID – Photoionization Detector
PLC – Programmable Logic Controller
PRGs – Preliminary Remediation Goals
Psi – pounds per square inch
PVC – Polyvinyl Chloride
QAPP – Quality Assurance Project Plan
QA/QC – Quality Assurance/ Quality Control
RA – Remedial Action
RAPFD – Remedial Action Plan Flow Diagram
RAWP – Remedial Action Work Plan
RCRA – Resource Conservation and Recovery Act
RD – Remedial Design
RI – Remedial Investigation
ROD – Record of Decision
ROs – Remedial Objectives
ROI – Radius of Influence
SDR – Standard Dimension Ratio
SER – Southeast Rockford Groundwater Contamination Superfund Site
SOW – Statement of Work
SS – Stainless Steel
Stantec – Stantec Consulting Corporation (formerly SECOR)
SVE – Soil Vapor Extraction
SWMU – Solid Waste Management Unit
TACO – Tiered Approach to Corrective Action Objectives
TCE – Trichloroethene
TOC – Total Organic Carbon
USAF – United States Air Force
USEPA – United States Environmental Protection Agency
VC – Vinyl Chloride
VOCs – Volatile Organic Compounds
VSP – Visual Sampling Plan
ZOI – Zone of Influence



1.0 INTRODUCTION

This document provides the work plan for completing the Remedial Action for source control for the Area 9/10 portion of the Southeast Rockford Groundwater Contamination Superfund site (SER) (CERCLIS ID No. ILD981000417) located in the City of Rockford, Winnebago County, Illinois (Figure Y1).

Hamilton Sundstrand Corporation (HS) entered into a Consent Decree (CD) with the United States Environmental Protection Agency (USEPA) on September 2, 2008 for the completion of Remedial Action (RA) for source control for Area 9/10. Preparation of the Remedial Action Work Plan (RAWP) was specified as part of the Statement of Work (SOW) associated with the RA.

Stantec Consulting Corporation (Stantec) was selected as the Supervising Contractor by HS in a letter to USEPA and the Illinois Environmental Protection Agency (IEPA) dated July 10, 2008 (the letter). HS based this selection on the experience and technical expertise provided by Stantec, which is detailed in the letter, and the fact that Stantec (formerly SECOR International Inc.) served as Supervising Contractor for the approved Remedial Design (RD) activities. The initial formulation of the HS RA project team was also discussed in the letter.

1.1 Purpose of the Remedial Action Work Plan

The purpose of the RAWP is to describe the performance of the RA at Area 9/10 of the SER, including a detailed description of currently planned remediation and construction activities and a project schedule of major activities and deliverables submissions during the course of the RA. This RAWP is being submitted in accordance with the timetable set forth in Section V of the SOW.

The selected remedy consists of air sparging (AS) and soil vapor extraction (SVE) to address impacted groundwater (referred to as leachate in the Record of Decision) at the Hamilton Sundstrand Plant #1 facility within Area 9/10. The remedy is described in the June 11, 2002 Record of Decision (ROD) for Operable Unit Three (OU-3) Source Control. In addition, soil identified as source material at the Outside Container Storage Area (OSA) will be excavated and disposed offsite and limited groundwater biological enhancement will be performed at this location. Limited excavation is also anticipated for two areas in the Loading Dock, which will be investigated as part of the RAWP activities.

Summaries of the selected remediation alternatives, air treatment, the excavation and disposal of impacted material from the OSA and Loading Dock, and the SWMU and groundwater source area investigation, are provided in Sections 2 through 6, respectively.

1.2 Site Background

1.2.1 Site Description

Area 9/10 (Area) is an industrial area located within the southeast portion of the City of Rockford, Winnebago County, Illinois. The Area is bounded by Eleventh Street on the east, Twenty-Third Avenue on the north, Harrison Avenue on the south, and Sixth Street on the west. HS was the only potentially responsible party identified by the IEPA for Area 9/10.

The HS Plant #1 facility (the facility) is located within Area 9/10. The facility is a generally rectangular area of approximately 13 acres and encompasses roughly the northeast quadrant of Area 9/10. The Area 9/10 and HS facility locations are shown on Figure Y1. The address of the facility is 2421 Eleventh Street. The facility is in Section 36 of Township 44 north, Range 1 east, of Rockford Township in Winnebago County. The facility is bounded on the north by 23rd Avenue and former Mid-States Industrial (2401 Eleventh Street), on the south by the former Nylint/DRB property (2525 Eleventh Street) and the Rockford Products Parking lot, to the west by 9th Street, and on the east by 11th Street. The facility utilities and property boundary for HS Plant #1 are shown on Figure Y2.

The SER consists of three Operable Units, each with a corresponding ROD. Operable Unit One (Drinking Water Operable Unit) provided some area residents with a safe drinking water supply by connecting 283 homes to the city water supply. Operable Unit Two (Groundwater Operable Unit) addressed the area-wide groundwater contamination. An additional 264 homes were connected to the city water supply and a remedial investigation (RI) was conducted to characterize the nature and extent of the groundwater contamination and to provide information on source areas responsible for contamination. This operable unit identified four source areas (Areas 4, 7, 9/10, and 11).

Operable Unit Three (Source Control Operable Unit) began as a State lead action to select remedies for each of the source areas. Based on the field investigation activities conducted by the IEPA at each of the areas, the USEPA and IEPA developed cleanup alternatives and selected remedies summarized in the May 2002 Source Control Remedies ROD. On January 13, 2003, the Region 5 Superfund Division Director issued an Administrative Order on Consent signed by Hamilton Sundstrand. The Administrative Order on Consent required HS to perform a RD at the Site to attain ROD objectives. HS has fully satisfied its obligations under this Administrative Order on Consent. Based upon the completed 100% RD, the selected technologies described in the ROD include, but are not limited to, SVE, enhanced air sparging in the shallow groundwater regime (leachate), and creation of a groundwater management zone (GMZ) within the Site. The term leachate is defined as water that passed through waste and contains elevated concentrations of contaminants through dissolution of contaminants present in the waste.



1.2.2 HS Plant # 1 Facility Constituents of Concern

The HS Plant #1 facility was identified during the RI, performed by Camp Dresser & McKee (CDM) for IEPA, and the Pre-Design Investigation (PDI), undertaken by HS, as containing groundwater impacted with VOCs above the Preliminary Remediation Goals (PRGs) identified in the ROD. The compounds detected at concentrations above the PRGs are referred to as constituents of concern (COCs). A network of 28 monitoring wells was established at the facility during the PDI. The monitoring well locations and topography (monitoring well ground surface elevations) are shown on Figure Y3.

The PRGs were based on 35 IAC Part 620 Groundwater Quality Class I groundwater, 35 IAC Part 742 Tiered Approach to Corrective Action Objectives (TACO), and USEPA maximum contaminant level (MCL) regulations. The groundwater COCs were identified as 1,1-dichloroethene (1,1-DCE); 1,2-dichloroethane (1,2-DCA); 1,2-dichloroethene (1,2-DCE); ethylbenzene; tetrachloroethene (PCE); 1,1,1-trichloroethane (1,1,1 TCA), 1,1,2-trichloroethane (1,1,2 TCA); trichloroethene (TCE); and vinyl chloride (VC), as agreed upon with USEPA and IEPA. The historical groundwater analytical results from the western portion of the building are shown on Figure Y4.

The soil COCs for Area 9/10 were identified as: 1,1-DCE; methylene chloride (MC) (possible laboratory artifact); PCE; 1,1,1 TCA; 1,1,2 TCA; and TCE as agreed upon with USEPA and IEPA.

The following sections describe the Site conditions considered in the selection and evaluation of the preferred remedy.

1.2.3 Hydrogeological Setting

The geological profile encountered at the facility generally consists of surface pavement (asphalt, concrete pad, or concrete floor slab) with a gravel fill subbase from ground surface to one to two feet below ground surface (bgs), underlain by silty clay to a depth of four to eight feet bgs, which is underlain by poorly to well graded sand (predominantly fine to medium sand) with some gravelly units to below the maximum depth of the borings at the facility (140 feet).

The sand and gravel has been reported to extend to a depth of 230 to 250 feet bgs in the vicinity of Area 9/10. This glacial outwash is identified as the Mackinaw Member of the Henry Formation. Bedrock encountered in borings/wells in the area is part of the Ordovician period Ancell Group (sandstone) of the Paleozoic era (CDM, *Remedial Investigation Report, Southeast Rockford Groundwater Contamination Study*, 1995).

The vadose zone extends within the sand to a depth of approximately 30 to 35 feet bgs. Within the vadose zone sand there is a discontinuous one to four feet thick silt layer at approximately 18 to 23 feet bgs which was identified in the OSA. This layer was observed only in a limited area in the northwest portion of the Site. No other substantive or continuous fine grained layers or lenses were documented during the



PDI investigation activities. At depth within the aquifer some coarser grained gravelly sand and sandy gravel units were observed.

The uppermost aquifer at the Site is the sand and gravel aquifer. The potentiometric surface level ranged between 30 and 33 feet bgs over the period May 2005 to February 2007. This level varies somewhat seasonally and appears to mirror the general rainfall pattern of the area. The average water level depth was approximately 32 feet bgs. The aquifer is greater than 100 feet in thickness at the Site. Recent data indicates the groundwater flow is to the west-southwest at a gradient of approximately 0.0008 feet per foot (ft/ft) (0.6 ft / 715 ft in March 2006) toward the Rock River.

The hydraulic conductivity of the sand aquifer has been estimated to be approximately 1.22×10^{-3} centimeters per second (cm/sec)(CDM, *Focused Feasibility Study* [FFS], 2000). The aquifer porosity was assumed to be 0.25 and the gradient 0.0066 ft/ft in the FFS. Using this hydraulic conductivity value and average porosity with the more recent hydraulic gradient data, it is estimated that the average linear velocity (also referred to as groundwater seepage velocity) is approximately 4 feet per year, but may have varied historically.

1.2.4 Extent of Soil Impacts

The initial RI activities completed by CDM in Area 9/10 consisted of soil gas samples and limited soil sampling. A more comprehensive Pre-Design Investigation consisting of 38 soil borings across the Site, including adjacent properties and public right of ways, was completed by HS in 2003 and 2004. This effort identified three areas of soils which exceed the PRG (and TACO) remediation objectives (ROs). These areas were the OSA, the loading dock and former container storage area, and the western part of the South Alley. The ROD requires that source material be addressed.

Soil in the OSA may be considered source material. Concentrations of 1,1,1-TCA, 1,1-DCE, PCE, TCE, mercury, cadmium, and lead were detected in samples S1 through S8 above ROs. A number of the constituents were found in only relatively shallow soil (less than 8 feet bgs). PCE and cadmium were the only constituents detected above ROs in deeper soils. These metals are not COCs as defined in the ROD. However, the OSA is also subject to RCRA regulations, and these metals are of concern from this perspective.

Per the *Pre-Design Investigation Report* (SECOR, 2006), soil concentrations at two boring locations (S12 and SMW-15) in the Loading Dock area may be considered source material. The elevated concentrations were all in the shallow soil sample intervals at these locations. There were no RO exceedances in the deeper soil samples analyzed at these locations and the impact is believed to be limited vertically. Impacted soil in the loading dock area will be addressed. This area is presently covered with asphalt.

There was a soil PCE RO exceedance at the SMW-5 location (5 to 7 feet) southwest of the HS Plant #1 building. There was, however, no PCE detected in the deep soil sample at this location. This area is not considered source material. This location is,

however, adjacent to the treatment zone of the air sparge and soil vapor extraction system in the South Alley.

The Volatile Organic Compound (VOC) impacted soil at the OSA is a 65 foot by 50 foot area of approximately 3,300 square feet. HS plans to address these soils by excavation with offsite soil disposal. The impacted soil is primarily in the soil column from ground surface to six feet in depth. The total estimated in place quantity of impacted soil at the OSA is 550 cubic yards (850 tons). Figure Y4 illustrates the lateral extent of soil impact above ROs at the OSA. A work plan for the excavation of the source material at the OSA was submitted to USEPA dated April 27, 2005 and was approved with modification on August 15, 2005. This work plan was subsequently added to the RD Final Design (100% Design).

Soil in the OSA may be considered source material.

1.3 Document Overview

The purpose of this document is to describe the performance of the RA at Area 9/10 of the SER, including a detailed description of currently planned remediation and construction activities.

Key components of the RA Work Plan as defined in this document include:

- Section 2 - Air Sparge System pilot test data review, basis of design, well design, piping, and equipment for the treatment area in the western portion of the South Alley is discussed in Section 2 of this document;
- Section 3 - Soil Vapor Extraction system pilot test data review, basis of design, well design, piping, and equipment for a capture zone for the air sparge injected air in the western portion of the South Alley is discussed in Section 3 of this document;
- Section 4 - Extracted air treatment basis of design for granular activated carbon and system controls equipment is discussed in Section 4 of this document;
- Section 5 - OSA groundwater attenuation enhancement for material placement, pre-placement monitoring and post-placement monitoring is discussed in Section 5 of this document; OSA soil excavation including necessary well abandonment, waste characterization, excavation, loading, transport, offsite disposal of source material, backfill, cap placement, and loading dock soil remediation is also discussed in Section 5;
- Section 6 - SWMU and groundwater source area investigation activities are discussed in Section 6 of this document;

- Section 7 - Supplemental investigation and remediation that may be required in addition to the approved investigation and remediation is discussed in Section 7 of this document;
- Section 8 - Overall assessment of the facility groundwater conditions is discussed in Section 8 of this document;
- Section 9 - Institutional controls for a facility groundwater use restriction (including development of a GMZ), commercial/industrial land use restriction, and an engineered barrier at the OSA are discussed in Section 9 of this document;
- Section 10 - Minimization of impacts to the public and the environment are discussed in Section 10 of this document;
- Section 11 - Methods of satisfying permit requirements are provided in Section 11 of this document;
- Section 12 - Schedule for required activities and submissions is provided in Section 12 of this document; and
- Section 13 - The additional documents and plans that compose the RAWP are summarized in Section 13 of this document. These include the Construction Quality Assurance Plan (CQAP), the Health and Safety Plan, the Groundwater Monitoring Plan, and the Contingency Plan, as outlined in the SOW and required in the ROD. These documents are submitted to the USEPA for review and approval.

This RA Work Plan also includes the following elements:

- A schedule for completion of the RA construction activities;
- A method for selection of the contractor;
- Methods for satisfying permitting requirements;
- A methodology for implementation of the Contingency Plan;
- The tentative formulation of the RA team (including, but not limited to, the Supervising Contractor);
- A methodology for implementation of the Construction Quality Assurance Plan;
- Procedures and plans for the decontamination of equipment and the disposal of contaminated materials; and
- The approved Remedial Action Process Flow Diagram.

2.0 AIR SPARGE REMEDIATION SYSTEM

Air sparging is a proven in-situ remedial technology for VOCs that consists of injecting air into the formation below the water table. The injected air transfers volatile organic compounds from the dissolved phase to the vapor phase. The air sparging system will be coupled with a SVE system. The SVE system is designed to remove the vapor phase VOCs generated by the air sparge process from the subsurface. The remediation system is designed to treat dissolved phase chlorinated solvent impacts located in the western portion of the South Alley of the Site and to also serve as a remediation barrier to mitigate potential future impacts as a result of contaminate migration.

2.1 Pilot Test Review

An air sparge pilot test was performed on one well and 15 AS and SVE monitoring points in the OSA area over the period of December 9-11, 2003. The test used a helium tracer to confirm the radius of influence (ROI) of the injected air. Air was injected at a depth of 43 feet below ground surface (bgs) (8 to 10 feet below the water table surface) at an air injection rate of 44 to 48 actual cubic feet per minute (acfm). The pilot test data indicated a zone of influence (ZOI) of 20 feet from the injection point. The final air sparge system design is based upon the results of the pilot study and is believed to be scalable to the planned treatment area located in the western portion of the South Alley based upon the relatively consistent geology observed in soil borings. The pilot test results indicated that AS is a viable technology for the treatment of the dissolved phase impacts at the Site. The pilot test results provided the following air sparge system design parameters:

- Radius of Influence – as measured by vacuum/pressure readings;
- Zone of Influence – air sparge; and
- Air injection flow rate.

Complete pilot test results can be found in the Pilot Test Summary Report dated October 1, 2004 and submitted to the USEPA.

2.2 Air Sparge Treatment Area

The planned AS system design consists of 15 air sparge wells. The treatment area is located in the western portion of the South Alley and is approximately 450 feet long by 30 feet wide. The length of the treatment area was determined from groundwater analytical results from the PDI activities. For groundwater, a concentration more than two orders of magnitude above the PRG/MCL for Class I groundwater was used as the criteria for designation as source material for treatment.

The width of the treatment area is defined by the design ZOI of the air sparge system. The pilot test results indicated that a ZOI of 20 feet was possible and therefore the AS wells have been designed with a 15 foot ROI to be conservative. The location of the

AS treatment zone area and well locations are shown on Figures Y4 and Y5, respectively.

2.3 Air Sparge Final Design

The 15 air sparge wells will be divided into three banks of five wells. Each bank of five wells will act as an independent treatment cell. The treatment cells will operate successively utilizing a timing relay and air solenoid valves.

Sparge injection pressure was calculated assuming a 17 feet treatment zone depth, 0.2 pounds per square inch (psi) air entry pressure for the filter pack, and 0.2 psi air entry pressure for the formation. Line losses due to friction were calculated using the Darcy-Weisbach equation. The design calculations and assumptions used are provided in Appendix A.

Each cell will initially receive a four hour long pulse of air at a flow rate of 20 cubic feet per minute (cfm), which was determined based upon the standard design model described in the United States Air Force (USAF) manual dated June 3, 2002 titled *Air Sparging Design Paradigm*. The pulse time may be adjusted based upon evaluation of the initial removal results. The total air sparge design flow rate per cell is 100 cfm. The minimum air sparge injection pressure to overcome the hydrostatic pressure is estimated to be 10.38 psi. The value includes an additional five feet of hydrostatic head to allow for higher than average water table levels.

The initial sparge period of four hours per cell was adopted based on design examples detailed in the USAF manual "Air Sparging Design Paradigm". The sparge air will be supplied by a Reitschle model DTB (06) 180 MACRO, 15 horsepower (hp), rotary vane compressor or equivalent. The compressor specifications and performance curves are provided in Appendix B.

2.3.1 Injection Well Design

The design calculations assume a treatment zone depth of 17 feet. The depth to groundwater is approximately 33 feet bgs [elevation 695 feet above mean sea level (MSL)]. The air sparge injection wells will have a screened interval of two feet. The bottom of the treatment zone is assumed to be at the top of the injection well screen at a depth of approximately 50 feet bgs. The depth of the injection wells will be 17 feet below the typical groundwater level for a total depth of approximately 52 feet bgs. The injection wells will be constructed with 1.5 inch diameter, 0.010 slot 304 stainless steel (SS) well screen, 304 SS riser, with schedule 40 polyvinyl chloride (PVC) riser above the water table. The wells will be installed using 8 inch (or greater) hollow stem augers or sonic drilling methods. The filter pack will be red flint #3545 (or equivalent) and extend 12 inches above the screen. A 12 inch sugar sand filter collar will be placed above the filter pack. The annular space of the sparge wells will be sealed using bentonite chips (or pellets) hydrated in place. The bentonite seal will extend three feet above the filter collar. Bentonite/cement grout (94% cement) will be used to seal the remainder of the bore hole to a depth of 42 inches bgs. At the 42 inch level, a PVC Tee will be connected to the riser and to the pressurized air supply line. A ball valve will be placed in line to regulate flow to the sparge well. Liquid filled pressure

gauges and sampling ports will be installed on each well head. Construction diagrams for the air sparge wells and the well vaults are shown on Figures Y6 and M2, respectively.

2.3.2 Equipment, Conveyance Piping, and Manifold

The air supply lines coming off the main header will be equipped with the following:

- Brass gate valve;
- Timer controlled solenoid valve;
- Dwyer model UV-C112 rotometer;
- Liquid filled 0-30 psi pressure gauge;
- 4-20 mA output pressure transducer; and
- PVC ball valve.

The brass gate valve will control air flow to the well. Air flow will be monitored using the rotometer. The solenoid valves will allow air flow to the sparge wells based upon timer relay programming. The timer relays will be incorporated in a programmable logic controller (PLC) allowing sequential air flow to each treatment cell. The liquid filled pressure gauges will allow visual monitoring of line pressure. The pressure transducers will allow remote monitoring of the line pressure using telemetry. The PVC ball valve will be used for gross flow adjustments and for cutting off air flow completely.

The air supply line coming off the compressor effluent will be equipped with the following:

- Pressure relief valve;
- High pressure switch;
- Low pressure switch;
- Flow meter;
- Temperature gauge;
- Liquid filled pressure gauge;
- 4-20 mA output pressure transducer;
- Ball valve; and
- Bleed valve.

The pressure relief valve is a safety mechanism. The valve will open at a preset pressure to avoid over-pressurizing the sparge wells. The high and low pressure switches will shut down the system in the event of a high or low pressure condition. The pressure switches will be connected to the telemetry system allowing for remote monitoring of alarm conditions. The flow meter will be an averaging pitot type flow meter which will be used to monitor total air flow from the compressor. The temperature gauge will be used to monitor the temperature of the air to the sparge wells. The liquid filled pressure gauge will monitor overall air pressure in the supply line. The pressure transducers will allow remote monitoring via telemetry of line pressure. The ball valve will regulate flow to the manifold. The bleed valve will be used to reduce air flow and air pressure. A piping and instrumentation diagram

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legend is provided as Figure P1. A diagram of the air sparge wells, process flow, and the instrumentation of the air sparge supply lines is provided as Figure P2.

The air sparge system conveyance piping will be constructed of 1.5-inch standard dimension ratio (SDR) 11 high density polyethylene (HDPE). The air sparge manifold main header will be constructed of 2-inch diameter schedule 40 galvanized steel pipe. The individual air supply lines will be constructed of 1.5-inch schedule 40 galvanized steel, 1.5-inch diameter schedule 40 PVC, and 1.5-inch SDR 11 HDPE. Figure P2 also shows the air sparge manifold layout and instrumentation. Figure M2 provides details of the air sparge piping manifold.

The air sparge system will be located in the northwest portion of the existing water tank building in the South Alley area. The layout of the AS system is shown on Figure M1.

3.0 SOIL VAPOR EXTRACTION REMEDIATION SYSTEM

The SVE remediation system is designed to capture chlorinated volatile organic compounds (CVOCs) in the vapor phase which have been volatilized by the air sparging activities. There were seven borings/wells completed in the western portion of the South Alley during the PDI activities. Only one of these locations exhibited CVOCs in soil above ROs (SMW-5). Therefore significant concentrations of CVOCs from the soils in the area aside from those liberated by the AS process are not anticipated. The SVE system is designed to remove the vapor phase CVOCs generated by the air sparge process from the subsurface.

3.1 Pilot Test Review

The SVE system design is also based upon the results of a pilot test conducted in the OSA over the period of November 17-18, 2003. Based on soil boring observations, the geology is relatively consistent across the Facility; therefore, the pilot test results are considered representative of the treatment area located in the western portion of the South Alley. The pilot test results indicated that SVE is a viable technology for the capture of contaminants liberated as a result of air sparge activities. The pilot test results provided the following design parameters:

- Radius of Influence – vacuum;
- Vapor extraction flow rate; and
- Soil permeability to air flow.

The complete SVE pilot test results can be found in the Pilot Test Summary Report dated October 1, 2004 and submitted to USEPA.

3.2 Soil Vapor Extraction Treatment Area

The six SVE wells will be divided into three banks of two wells. Each bank of two wells will act as an independent treatment cell. The SVE banks will operate sequentially in concert with the air sparge banks under the control of a timing relay and air solenoid valves. The approximate location of the SVE treatment zone area and well locations are shown on Figures Y4 and Y5, respectively.

3.3 Soil Vapor Extraction System Final Design

The six SVE wells are based upon a design ROI of 50 feet. The extrapolated ROI from the pilot test data was 60 feet. A 50 foot ROI was used in the design calculations as a safety factor. The actual SVE ROI may be greater due to a design vacuum of 60 inches of water (H₂O). The actual SVE ROI will be measured once the system is fully operational. Line friction losses were calculated for the SVE system and factored into the sizing of the blower.

The SVE vacuum pressure and flow rate was determined by extrapolating the results of the SVE pilot test. The pilot test achieved 76 acfm at 20 inches of water using a 2

hp regenerative blower. The SVE step test data was extrapolated for the remedial design. The SVE system design calculations, assumptions, and pipe friction loss calculations using the Darcy-Weisbach equation are provided in Appendix C. A larger regenerative blower capable of achieving 200 acfm at 60 inches of water is specified. The specified vacuum blower is a Reitschle Bora Model SAP 380, 6.4 hp regenerative, side channel blower (or equivalent). The blower specifications and performance curves are provided in Appendix D. Each cell will initially receive five hour pulses of suction depending on the air sparge duration. The pulse duration may be adjusted based upon the evaluation of the initial results.

3.3.1 Extraction Well Design

The extraction well design will consist of a 10 foot section of 4-inch diameter, 0.010 slot PVC well screen connected to 4-inch diameter PVC riser. The depth to groundwater in the treatment area is typically 33 feet bgs. The screened interval of the extraction well will terminate three feet above the average water table level to reduce the effect of groundwater mounding and potential masking of the extraction well screen. The exact screened interval will be determined during installation. The wells will be installed using 8-inch or larger hollow stem augers or sonic drilling technology. The filter pack will be red flint #3545 filter sand pack (or equivalent) and will extend 12 inches above the screened interval. A 12-inch sugar sand filter collar will be placed above the filter pack. The SVE wells will be sealed using bentonite chips (or pellets) hydrated in place. The bentonite seal will extend three feet above the filter pack. Bentonite/cement grout (94% cement) will be used for the remainder of the bore hole to a depth of 42 inches bgs. At the 42 inch level, a PVC Tee will be connected to the riser and to the extraction line. A ball valve will be placed in line to regulate flow from the extraction well. The well head will have liquid filled vacuum gauges and sampling/monitoring ports installed. Construction diagrams for the SVE wells and well vaults are provided on Figures Y6 and M2, respectively.

3.3.2 Equipment, Conveyance Piping, and Manifold

The vacuum lines coming off the main header will be equipped with the following equipment:

- Brass gate valve;
- PVC ball valve;
- Timer controlled solenoid valve;
- Actuated make-up air valve;
- 12 inch long, 2 inch diameter clear PVC sight gauge;
- Liquid filled 0-80 inch water vacuum gauge;
- 4-20 mA output pressure transducer; and
- 3/8-inch brass ball valve for monitoring.

The brass gate valve will control vacuum and air flow from the well. Air flow will be monitored using a self averaging pitot tube inserted into the sampling port. Velocity and static pressures will be measured with a magnehelic gauge and converted into flow rate. The PVC ball valve is used for gross flow and vacuum adjustments and for

shutting the well off completely. The solenoid valves will open the extraction wells to vacuum based upon timer programming. The timer will be programmed to allow vacuum to each treatment cell sequentially. Using the telemetry system, the actuated make-up air valve will allow remote adjustments to line vacuum. The PVC sight gauge will allow for external monitoring of groundwater or condensate. The liquid filled gauges will provide visual monitoring of line vacuum. The pressure transducers will allow remote monitoring via telemetry of line vacuum. The 3/8-inch ball valve will be used as a sampling port and flow monitoring point.

The extraction air line coming into and out of the vacuum blower will be equipped with the following:

- Vacuum relief valve;
- Self averaging pitot tube flow meter;
- Temperature gauge;
- Liquid filled vacuum gauge;
- Ball valve; and
- Make up air valve.

The vacuum relief valve is a mechanical valve that will open at a preset pressure in the event of a high vacuum condition to avoid high vacuum conditions which could potentially damage the blower. The flow meter will be an averaging pitot type flow meter which will be used to monitor total air flow from the vacuum blower effluent. The temperature gauge will be used to monitor the temperature of the vacuum blower effluent. The liquid filled pressure gauge will monitor vacuum pressure at the blower influent. The ball valve will regulate flow to the manifold. The make up air valve will be used to supply ambient air to reduce vacuum at the manifold.

The SVE system conveyance piping will be constructed of 2-inch SDR 11 HDPE. The SVE manifold main header will be constructed of 3-inch diameter schedule 40 PVC pipe and fittings. The individual vacuum lines will be constructed of 2-inch diameter schedule 40 PVC, and 2-inch SDR 11 HDPE. Figure P2 shows the SVE system manifold layout, process flow, and instrumentation. Figure M2 shows the details of the SVE piping manifold. The SVE system will be housed within the existing water tank building. The SVE system layout within the building is shown on Figure M1.

3.4 Air and Water Separation

Entrained water vapor in the vacuum lines will be removed and collected by an air/water separator. The air/water separator specifications will be matched to the vacuum and flow rate of the regenerative blower. The air/water separator will contain automatic level controls with redundant high-high alarms. The level controls will be housed in a stilling well attached to the side of the air/water separator. The air/water separator system will be designed to automatically gravity discharge to an air sparge well in the event of a high level condition.

4.0 EXTRACTED AIR TREATMENT AND OPERATION

4.1 Vapor Phase Treatment

The vapor phase treatment system will consist of two granular activated carbon (GAC) units plumbed in series and designated the primary and secondary units. The secondary carbon unit will act as a back up in the event CVOC breakthrough occurs at the primary unit. Once breakthrough is observed, flow will be redirected such that the secondary unit will become the primary unit and the original primary unit will be changed out and become the secondary unit. Each unit will be a Carbonair GPC 20R containing 2,000 pounds (lbs) of GAC designed for vapor phase adsorption (or equivalent). Technical specifications of the air treatment system are provided in Appendix E. The carbon units will be connected using flexible hose and quick disconnect fittings to facilitate installation, unit change out, and removal. Air discharge sampling ports will be installed before and between the carbon units, and at the discharge. Due to the operating nature of AS/SVE systems where there are higher initial CVOC concentrations in the soil vapor that decrease with time, it is anticipated that the carbon units will be utilized primarily only during the initial phase of system operation. The carbon units will be taken off line once effluent CVOC concentrations no longer exceed permit required conditions. The layout of the GAC units within the treatment building is shown on Figure M1.

4.2 Electrical Requirements

Calculations were performed to determine if there was a potential need to use explosion proof controls, equipment, and wiring in the equipment building. The maximum concentration of flammable CVOCs in the extracted vapor stream was calculated using the groundwater data collected from monitoring wells located in the treatment area. The groundwater data used was from the November 17, 2004 sampling event. Soil CVOC analytical concentrations from soil samples taken during the PDI from within the treatment area were either below the method detection limit or at trace levels. Therefore, the anticipated maximum potential CVOC vapor concentrations produced by the AS/SVE system are based upon dissolved phase groundwater concentrations only. To determine the estimated maximum potential vapor concentrations, calculations were made using Henry's Law equilibrium constants to estimate the highest CVOC concentrations across the treatment area. Average CVOC concentrations in the extracted air were also estimated using the same method.

The results show that the maximum vapor concentration anticipated at the Facility is 8,360 parts per million by volume (ppmv) and over 39% of these vapors would be 1,1,1-TCA. Using this maximum vapor concentration (which is the most conservative), the highest concentration of flammable CVOCs in the extracted vapors is not anticipated to exceed 11% of the lower explosive limit (LEL) for 1,1,1-TCA. Based on these calculations, explosion proof controls including equipment and wiring for the AS/SVE system at the Site are not necessary. The soil vapor (flammable, maximum, and average) CVOC loading calculations are provided in Appendix F.

Electrical requirements for the major components of the AS/SVE system will be as follows:

Equipment	Voltage	Horsepower	Amperage	Phase
Regenerative Vacuum Blower	230	6.4	19	3
Rotary Vane AS Blower	230	15	41	3
Solenoid Valves	120	NA	10.5	1
Controls	120	NA	10	1

The electrical distribution system will consist of a 230 volt, 200 amp, three phase, 60 Hertz service provided by the facility through a fusible disconnect. A breaker panel will be installed to provide 230 volt, three-phase power to the major electrical components of the system. An additional breaker panel will be installed to provide 230/120 volt, single-phase power for auxiliary and control systems. All electrical installations will be in accordance with the National Electric Code. The SVE blower, AS compressor, and control panel box will have the appropriate National Electrical Manufacturers Association (NEMA) rating in accordance with local building codes and ordinances. The electrical symbols legend used are shown on Figure E1. An electrical one-line diagram of the remediation system is provided as Figure E2.

4.3 System Controls

The AS/SVE system will contain associated safety features to protect the equipment and surroundings. The system will be designed to operate up to 24 hours per day, 365 days per year, except for planned periodic maintenance shutdowns. The AS/SVE system will be equipped with a telemetry system which will provide notification of any system alarm condition and/or system shut down. In the event of a transient power failure, the telemetry system will allow remote system restart.

The air/water separator unit will be equipped with high level, low level, and high-high-level stainless steel conductivity probes. The probes will be installed in a stilling well located on the side of the air/water separator vessel. The purpose of the stilling well is to damper the effects of turbulence caused by vacuum on the control surfaces. The air/water separator control logic will function in the following manner. When the extracted water level in the air/water separator reaches the high-level conductivity probe, a timer relay will be activated. The timer relay will turn off the SVE blower and the AS blower for a predetermined amount of time. With the reduction in vacuum, a flapper valve will open at the bottom of the vessel and allow the condensed soil moisture to gravity discharge to an air sparge well. At the end of the timer sequence, the AS/SVE system will restart and normal operations will commence.

Air pressure switches will be installed in the air sparge system manifold. The pressure switches will monitor the discharge pressure from the air sparge blower. The switches will be set for a low pressure condition and a high pressure condition. In the event that the maximum air pressure is exceeded or the minimum air pressure is



not met, the system will be shut down. The pressure switch controls will include a timer. To eliminate the effects of transient pressure conditions, the system will shut down only if the maximum or minimum pressure condition is maintained throughout the entire programmed timed interval. For example, a high air pressure condition must be maintained for the duration of the timed interval (usually 30 seconds) to trigger the high pressure alarm.

A mechanical, spring operated, high vacuum pressure relief valve will be installed at the influent of the SVE vacuum blower. The vacuum relief valve will be adjustable. In the event the blower vacuum exceeds the relief valve preset maximum condition requirement, the valve will open to the atmosphere reducing the vacuum. The vacuum relief valve will be monitored by the telemetry unit and an alarm message will be sent when the relief valve is opened.

The motors for the air sparge compressor and the vacuum blower will be protected using thermal overloads on the motor starters. The thermal overloads will turn off the motors when preset amperage is exceeded. In the event of an amperage exceedance, the AS/SVE system will be completely shut down. The telemetry system will send out information concerning the shut down. For this condition the system restart will have to be performed manually. The details of the system controls are provided in the electrical one-line diagram provided as Figure E2.

The air treatment components will be housed in the northwest portion of the firewater tank building along with the AS, SVE, and air/water separator equipment. A poured concrete floor will be constructed over the existing pea gravel floor in this part of the building. The building has exterior metal walls set on a concrete foundation wall. The water tank building has access directly to the south alley via double doors. Additional details of the equipment layout are provided on Figure M1.

5.0 OUTSIDE CONTAINER STORAGE AREA GROUNDWATER ATTENUATION ENHANCEMENT AND SOIL EXCAVATION

A work plan entitled Final Outside Container Storage Area Source Material Mass Reduction Work Plan was developed based on comprehensive soil sampling completed in the OSA during the PDI activities. This document was originally prepared and submitted to the USEPA and IEPA by Stantec in April 2005. In July 2005, comments were addressed and the work plan was approved with modification in a USEPA letter dated August 2005. An updated final work plan incorporating the USEPA comments and the August 2005 requested modifications was submitted as part of the Remedial Design in July 2006. Additional comments from the USEPA and IEPA have been incorporated into the work plan, which is provided in Appendix G. The work plan includes a discussion of the history, objectives, and rationale for the following activities: natural attenuation enhancement; well abandonment; soil excavation; offsite hazardous waste disposal; excavation backfill; and clay cap construction. A brief overview of each of these activities is provided below.

5.1 Natural Attenuation Enhancement

A Regenesi[®] product, Hydrogen Release Compound Extended Release Formula (HRC-X), will be introduced into the groundwater underlying the OSA through the screened portion of the existing access points (wells). HRC-X is a glycerol polylactate product which slowly releases lactate stimulating microbes to generate hydrogen into groundwater for an extended period of time and creating sufficiently anaerobic conditions to facilitate the biodegradation of CVOs. Additional details regarding the use of the product are provided in Section 3.0 of Appendix G.

5.2 Well Abandonment

The 18 existing wells in the OSA will be abandoned in accordance with the Illinois Water Well Construction Code Section 920.120, after the HRC-X placement, in preparation for the excavation activities. The soil vapor extraction, air sparge, vacuum monitoring, and air sparge monitoring wells or points with a depth greater than five feet will be properly abandoned by filling the well with a cement bentonite slurry installed via tremie pipe to a depth of four feet bgs. The near ground surface portion of the well risers will be removed in connection with the OSA excavation activities. The shallow wells (five feet or less in depth) will be completely removed as part of the excavation activities.

5.3 Soil Excavation Activities

Excavation in the OSA is planned to extend across the entire area (65 feet by 50 feet) to the target depths (four to six feet) identified during the PDI and other investigations. The clean surface pea gravel overlying the concrete pad will be stockpiled and reused. The concrete, impacted underlying gravel, and silty clay soil in the area will be excavated. The estimated volume of impacted material to be removed is 550 cubic yards or approximately 850 tons of material. The excavated material will be

placed in lined container boxes with tarps or loaded directly in trucks with lined boxes and tarps.

The planned excavation area is bounded immediately to the west by a public sidewalk and right of way which contains utilities, to the south by a local spur line of the Illinois Central Railroad, to the east by a grass and landscaped area, and to the north by an asphalt access road to the HS employee parking lot. Access in the form of a right of entry from the Illinois Central Railroad will need to be obtained as a portion of this area is leased. Prior to commencing the work, a public utility locate via the JULIE one call system will be made as well as a private utility locate for onsite utilities.

Additional details regarding the waste characterization, health and safety considerations, utility line location, soil excavation and loading, soil transportation, decontamination procedures, and excavation sampling are provided in Section 3.0 of Appendix G.

5.4 Offsite Hazardous Waste Disposal

The waste will be shipped to a HS approved hazardous waste disposal facility. After preliminary disposal facility evaluation and selection, and approval by the facility for acceptance of the waste, the material will be transported, treated as necessary, and disposed. Documentation of the facility approval and receipt of the waste will be provided to the USEPA and IEPA.

5.5 Excavation Backfill

Clean backfill from a documented local source will be used. At a minimum, the top three feet of fill will be a clay soil. The timing and manner of backfill placement will be dictated by the actual conditions at the time of the excavation. Considerations will include backfill source material availability, inspection scheduling, excavation stability, and safety. If existing infrastructure or utilities are considered vulnerable, backfill placement will be completed immediately following the excavation and sampling activities. Additional details regarding the excavation backfill are provided in Section 3.0 of Appendix G.

5.6 Clay Cap Construction

As previously discussed, at a minimum, the top three feet of backfill material will be clay soil. The soil will be placed in one foot lifts over the excavated area and compacted with the excavating equipment. The area will then be top dressed with suitable topsoil and seeded with grass to minimize erosion and for aesthetic purposes. There is minimal to no slope in this area, therefore additional erosion protection measures are not necessary. Additional details regarding the cap construction are provided in Section 3.0 of Appendix G. A cross section of the clay cap engineered barrier is provided as Figure Y7.



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5.7 Loading Dock Soil Remediation

Soil in the vicinity of borings S12 and SMW-15 will be addressed through investigations to assess the extent of impact in these areas (see Section 6 for further details). Based on current data, the remedial activities will consist of limited excavation, pending final delineation. Soil removal in the area may require abandonment of monitoring well SMW-15. This area is presently paved with asphalt.

6.0 SWMU AND GROUNDWATER SOURCE AREA INVESTIGATION

6.1 Introduction

This section presents the approach for completing required sampling as part of the RA process at the facility.

The HS Property manufactures extremely high precision aerospace/aeronautical parts and its sizeable manufacturing processes have so far precluded a more complete assessment of contaminant sources, including Solid Waste Management Units (SWMUs) and areas of concern (AOC), within the building footprint. However, access will become available over time to address closure of certain SWMUs and leaking underground storage tanks (LUST Incident area) discovered in 2000. HS will use the RA process to provide the framework for the inspection and investigation of these areas which were identified under Section II.I. of the SOW, as they cease operations and become accessible. SWMUs not identified in the SOW will be addressed through the Resource Conservation and Recovery Act (RCRA) process with the USEPA RCRA Group. If any of these SWMUs are deemed to adversely affect groundwater, HS may propose to add these SWMUs to the Remedial Action activities, if appropriate.

The goals of the SWMU and groundwater source area investigation are to:

- Comply with EPA and IEPA corrective measures directives;
- Refine the site geologic model for the vadose zone;
- Implement a consistent investigation strategy that can be applied to different areas of the facility to facilitate characterization and regulatory review;
- Characterize contamination present at SWMUs, AOCs, and previously unidentified impacted locations for use in remedial design activities; and,
- Obtain data that meets quality assurance/quality control (QA/QC) objectives, is defensible, and will meet regulatory requirements for closure.

The objectives intended to help achieve these investigation goals are to:

- Investigate selected SWMUs and AOCs in accordance with the CD, the SOW, and RCRA requirements (as applicable);
- Assess conditions in a strategic and unbiased manner at other locations to obtain geological information and identify potential sources of impact to soil or groundwater; and,

- Obtain sufficient data to assess the extent of impact and constituents of concern in a treatment area(s) so that supplementary remedial technologies may be designed and implemented as necessary.

6.2 Selection and Optimization of Sampling Strategy

The basis for the sampling strategy described in this section is the investigation of soil conditions at both biased and unbiased locations within the facility, to determine the presence, magnitude, and extent of impacts associated with historical facility operations that may be designated as source areas.

The data obtained will allow HS to identify which areas may need further investigation and/or remediated to address RA requirements, if any. The sampling strategy set forth in this document is based on several sources, including:

- 1) Industry standard approaches for waste characterization and assessment sampling designs:
 - ASTM D 6311-98 (Generation of Environmental Data Related to Waste Management Activities: Selection and Optimization of Sampling Design); and
 - ASTM E 1903-97 (Guide for Environmental Site Assessments, Phase II Environmental Site Assessment Process).
- 2) USEPA guidance:
 - EPA QA/G-5S (Guidance on Choosing a Sampling Design for Environmental Data Collection, 2002); and
 - Superfund Program Representative Sampling Guidance, 1995.
- 3) IEPA guidance:
 - Guidance for Preparing RCRA Closure Plans, IEPA, 2003.

These sources were used to develop a comprehensive sampling strategy in conjunction with site knowledge and data previously generated at the facility. The sampling strategy presented is based on an iterative process of selecting and evaluating designs to determine the most resource-effective means that also meets the project goals and objectives.

6.3 Determination of Systematic Sampling Grid Parameters

In order to determine a simple, defensible grid based approach for conducting the unbiased, systematic sampling during the RA investigation, Stantec utilized the statistical software Visual Sample Plan (VSP version 4.6, 2008 Battelle Memorial

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Institute). This software utilizes statistical and mathematical algorithms to optimize the relative position of sampling locations and is recommended in US EPA sampling design guidance (US EPA, 2002). Site specific inputs were included in the model with the following described scenario selected as a defensible sampling design for screening an area of the Site that remains largely uninvestigated. This area in the southwest portion of Plant 1 included manufacturing operations that could potentially have historically experienced a release.

The primary objective of the sampling design is to detect with a specified probability the presence of a “hotspot” (local area of elevated concentration) of a specified size and shape. The approach requires systematic grid sampling with a random start point.

The algorithm used in VSP to calculate the grid size is attributed to Singer and Wickman (Singer 1972, 1975 and PNNL-13450). Inputs to the model include the size, shape and orientation of a hotspot, an acceptable probability of not finding a hotspot, and the desired sampling grid pattern. Sampling budget was not used as a constraint in consideration of the sampling design, so the cost input served as a placeholder only.

The inputs to the algorithm that result in the proposed grid size include:

- Sampling area is approximately 500 ft by 200 ft, or 100,000 ft²;
- Probability of detection is 90 percent;
- Grid pattern is triangular;
- Shape of hotspot is circular;
- Length of hot spot axis is 25 ft; and
- Area of hotspot is approximately 1,965 ft².

The outputs for the proposed sampling design are:

- Size of grid (spacing between samples) is approximately 50 ft;
- Area of grid (triangular areas between points) is approximately 2,180 ft²; and
- Optimum number of samples is 46 to 50.

The model output is provided in Appendix H. It includes a map of the sample locations so that it may be compared to the actual field implementation upon completion of RA investigation activities. Note that the program assumes no constraints in placement of these locations. In reality, there are numerous walls, some inaccessible areas, and other structures that may alter placement or even preclude completion of borings in some locations. Locations that are inaccessible will be modified in the field, if possible, to the nearest reasonable accessible location.

6.4 Soil Sampling and Well Installation Methodology Decision Process

A comparison of potential soil sampling and well installation methodologies and the proposed steps involved in characterizing Site soil and groundwater conditions are

provided in Table 1. The methodology selected for conducting the RA soil investigation is direct push with closed piston sampling. Use of a drill rig with hollow stem augers (HSA) is proposed as the method for RA groundwater investigation well installation. These techniques are referred to collectively as Option A.

The four options that were considered are summarized below:

- Option A - Direct push with Closed Piston Sampling for soil and HSA for groundwater;
- Option B - Membrane Interface Probe (MIP) screening and confirmatory direct push sampling for soil and HSA for groundwater;
- Option C – HSA for soil and HSA for groundwater; and
- Option D – Sonic drilling for soil and Sonic drilling for groundwater

Option A

Use of direct push with Closed Piston Sampling is considered preferable for soil investigation at the Site because this technique (also referred to as discrete sampling, and described in more detail below) reduces the risk of collecting sloughed or collapsed side wall materials during sampling, a risk inherent and significantly greater with some other technologies when working in unstable sand geology such as that existing at the Site. The approximate investigation duration with each option is comparable, but Options B, C and D were all considered to have disadvantages compared to Option A. These disadvantages are discussed below.

Option B

Both the MIP and the standard direct push technologies are susceptible to encountering refusal, and standard direct push allows caving of the unstable sand soils within borings. Though MIP could provide an efficient initial screening of the unbiased grid sampling locations, the lack of contaminant specific laboratory data from all locations would result in a less complete site model than that of the other technologies.

Option C

Use of HSA for all investigatory efforts would be slower and more expensive than Option A. Part of the greater expense would be attributed to a much greater volume of generated waste that would require handling and disposal.

Option D

Relatively few contractors perform Sonic drilling, so mobilization is expensive based on proximity to providers. Therefore, separate investigation phases would need to be combined to be cost effective, which could prevent adequate data reduction necessary to effectively scope subsequent investigation phases. Greater waste handling and disposal is another disadvantage of this Option in comparison with Option A.

6.5 Direct Push with Closed Piston Sampling

The screening phase (unbiased borings) and characterization phase (biased borings) of environmental testing at the facility will be completed using direct push equipment. Cores will be collected continuously for soil description, photoionization detector (PID) screening, and sample collection for laboratory analysis. The cores will be collected using a Geoprobe* Macro-Core* Sampler and a piston rod point assembly (or equivalent). As noted above, this technique can prevent the mistaken collection of unrepresentative samples from higher elevation sloughed or collapsed side wall material.

With this “closed piston sampling” approach, the sampler is equipped with a piston rod point assembly. Inner extension rods are inserted continually through the probe rod string until reaching the desired sampling depth. This maintains pressure on the piston point and allows the sampler to be advanced to the top of the next sampling interval without collecting slough on the way down.

When the desired depth is reached, no additional inner extension rod is added to the rod string. The rod string is driven into the subsurface to fill the sampler with soil as the piston point is pushed up, since pressure is no longer being applied to it. The point assembly is then retrieved from the sampler along with its liner and the soil core. A “core catcher” is typically used when working with non-cohesive soils to prevent loose soils from falling from the bottom of the sampler.

6.6 Selection of Boring Locations

A combination of both biased and unbiased (systematic grid) sampling locations are proposed.

6.6.1 Biased Sampling Locations

Biased sampling locations have been selected based on professional judgment considering the prior use history of the property. They include SWMU and AOC locations noted in the *Declaration for Record of Decision* (“the ROD”, dated May 2002) as well as other documented SWMU and AOC locations with the potential for CVOC impact. Employee interviews, maps, aerial photos and other historic documents were reviewed to ground-truth the judgments made.

The biased locations also include two groundwater monitoring wells, which will be installed immediately upgradient of the facility, to the west and east of existing monitoring well SMW-19 in the north alley of Plant 1. Periodic evaluation of concentrations of COCs identified in upgradient wells will be performed as part of the site groundwater monitoring activities (see Section 8 for further details). The proposed biased locations are shown on Figure 1.

The selected biased sampling locations are intended to:

- 1) Address SWMUs and AOCs that could not previously be investigated due to ongoing site operations in the building;

- 2) Characterize conditions at the SWMUs and AOCs, as identified from prior use history;
- 3) Address the goal of compliance with corrective measures directives;
- 4) Provide sufficient data population and quality to assess remediation needs and evaluate risk; and
- 5) Identify the potential migration of COCs in groundwater from other areas immediately upgradient to the facility.

6.6.2 Unbiased Sampling Locations

There is potential that some areas of unknown historic impact could be missed by a solely biased investigation approach because there were likely numerous manufacturing related activities across the entire area over the years and it is not practical to investigate every conceivable location. Therefore a systematic investigation will be conducted, which will be targeted to identify areas of the Facility that could be missed by biased sampling only. These areas of unknown potential impact may be related to general site use and have no identified specific source location, but could have contributed to impacts observed in soil or groundwater. These areas may be considered "non-point" sources of impact.

A uniform grid size of 50 feet is required to identify a circular hotspot of 25 feet in diameter, as previously discussed. The systematic sampling locations will be identified from a 50-foot triangular grid beginning at a random location near the southwest corner of the Plant 1 facility. Sampling was considered unwarranted for areas where prior manufacturing operations have not historically occurred. The proposed unbiased boring locations are shown on Figure 2.

The selected systematic grid sampling locations are intended to:

- 1) Further characterize site conditions;
- 2) Provide the required data to develop a definitive/concise site geologic model for the vadose zone; and
- 3) Provide a quantifiable degree of certainty of not missing "hot spots" that might exist aside from the potential point source SWMUs and AOCs identified from prior use history.

6.7 Selection of Soil Samples for Laboratory Analysis

Existing structures or equipment may alter placement or preclude completion of some borings. Locations that are inaccessible will be modified in the field to the nearest reasonable accessible location, if possible. If reasonable or necessary, an unbiased boring location may be substituted for one or more of the biased borings in the 2000 LUST Area.

Environmental soil sampling will consist of both screening level field-based analyses and analytical laboratory samples. Soil at all locations (biased and systematic) will be physically sampled and logged to termination depth. Borings will be completed to the first encountered groundwater (approximately 30 to 35 feet bgs).

All soil samples will be evaluated based on a field screening process consisting of PID measurements and visual and olfactory observations. The field screening selection criteria for submittal of samples for chemical analysis are as follows for the biased and unbiased systematic sampling.

A minimum of three (3) soil samples will be submitted from each boring location for laboratory analysis. Analytical samples will be selected based on field screening criteria, potential risk evaluation needs, and development of a complete site model. Accordingly, one sample will be collected from above 10 feet bgs at each boring location to assess the condition of the anticipated upper clay layer, one sample will be collected near the capillary fringe, and one additional sample will be collected from each boring based on soil screening, visual and/or olfactory indications of impact or other pertinent observations. If warranted, additional soil samples may be collected to adequately characterize the contaminant distribution.

Quality control (QC) samples will be collected as part of the sampling effort. Field QC samples will be submitted as separate samples to the laboratory and be reported accordingly. Trip blanks, rinsate/equipment blanks, matrix spike, matrix spike duplicates, and field duplicates will be collected during this investigation. Additional information regarding the preparation and frequency of these samples will be provided in the Quality Assurance Project Plan (QAPP).

The extent and distribution of COCs in soil will be characterized by analysis of VOCs via Method 8260B. The VOC samples will be collected in accordance with Method 5035 with a syringe sampler, and extruded into 40-ml glass vials preserved with methanol and sodium bisulfate provided by the laboratory. Additional details will be provided in the Field Sampling Plan (FSP) and the QAPP.

The physical parameters total organic carbon (TOC), porosity, grain size analysis and hydraulic conductivity will also be collected as required for use in future remedial design activities.

In addition to QA/QC performed by the laboratory on the generated data, Stantec will complete an independent QA/QC review of the laboratory data. A percentage of the data will undergo Level 4 data validation procedures. Additional details will be provided in the QAPP.

Field screening measurements, visual observations, and concentrations of COCs in the samples as indicated by the laboratory results will be used to assess the potential presence of dense non-aqueous phase liquids.

6.8 Groundwater Source Area Investigation

6.8.1 Systematic Grid Boring Groundwater Sampling

A groundwater screening investigation will be conducted concurrent with the unbiased soil sampling investigation for the purpose of characterizing the general distribution of dissolved phase contaminants in groundwater and guiding the installation of longer term groundwater monitoring points.

Upon completion of soil sampling at each of the unbiased soil sampling locations, a slotted metal rod will be advanced up to five feet deeper into the water-bearing sands for the purpose of groundwater sample collection. Screening samples will be collected of the groundwater that enters the slotted pipe using tubing and a pump or small diameter bailer. The proposed unbiased boring locations are shown on Figure 2. Groundwater samples will be collected in 40-ml glass vials provided by the laboratory, and analyzed for VOCs via method 8260B.

The QA/QC sample collection and data review will be similar to that of the soil sampling effort. Additional details will be provided in the QAPP.

The groundwater data obtained will be used to assess the need for augmentation of the approved AS/SVE system to address additional groundwater source areas (if present) observed during the systematic grid sampling.

6.8.2 Monitoring Well Installation

As part of the groundwater source area investigation, monitoring wells will be installed in a series of transects perpendicular to the general groundwater flow direction. Up to 12 monitoring wells will be installed in the southwest portion of the site in order to obtain data documenting current conditions and to observe changes in conditions over time as remedial efforts progress. The results of the systematic grid boring groundwater sampling will be used to determine the appropriate number and locations of the monitoring wells. Additional monitoring wells may also be installed in other strategic locations as determined by results of the soil investigation.

The wells will be installed using hollow-stem augers. Soil cores will be collected continuously for logging purposes using split-spoon samplers. Soil screening will be conducted during split-spoon core collection, and samples will be collected for laboratory analysis if conditions suggest additional soil data from any of the well locations would be beneficial.

The wells will be installed to a depth of approximately 45 feet bgs, and will include 15-foot screens. The wells will be constructed of polyvinyl chloride (PVC) materials, which are considered appropriate for use in monitoring CVOCs in the absence of free product. This standard may be reassessed if results of groundwater sampling analysis from the unbiased boring locations in the area suggest the need for stainless steel materials to avoid incompatibility issues.

Two groundwater monitoring wells will also be installed upgradient of the facility, to the west and east of current monitoring well SMW-19 in the alley north of Plant 1. These wells will also be installed using hollow-stem augers, but cores will not be

collected for logging purposes or for soil sampling. Limited soil logging and screening will be conducted on the cuttings generated from the wells installations. The wells will be constructed of PVC materials to a depth of 45 feet bgs.

6.9 Sampling Equipment Decontamination and Waste Disposal

All down-hole drilling equipment will be steam-cleaned prior to initiation of any drilling activities and between each boring. Reusable sampling tools will be decontaminated between uses with a potable water and non-phosphate detergent wash followed by a distilled water rinse. All decontamination fluids will be containerized and retained in a secure location on-site and properly characterized.

Solid waste will be generated during the course of the RA. Soils will be generated from boring and monitoring well installation. It will be collected at the borehole/monitoring well location and placed either in 55-gallon drums or transported to a lined and covered roll-off box. Soil from the OSA excavation will be considered as containing listed hazardous waste. Soil from other areas will be evaluated to determine if the soil is characteristically hazardous.

Liquid waste will be generated from well development, sampling, and decontamination procedures. Liquid waste will be collected at the monitoring well locations and the decontamination areas and properly managed, containerized, and stored prior to disposal. Containers may include, but are not limited to, 55-gallon drums, 110-gallon polyethylene tote tanks and 550-gallon portable tanks. The liquid wastes, including those generated from decontamination procedures at the OSA, will be evaluated to determine if they are characteristically hazardous.

7.0 SUPPLEMENTAL REMEDIATION

7.1 Remedial Action Process Flow Diagram

A “Remedial Action Process Flow Diagram” (RAPFD, see Figure 3) was developed cooperatively with all parties during the CD and SOW discussions. This document was approved by USEPA and IEPA for use at the HS Property. This diagram captures the agreements and intent of the discussions with regard to the implementation of Remedial Action, and the use of alternative measures and the attainment of Performance Standards.

The approved RAPFD describes the process for the continued operation of the System until HS either proposes, based on “objective analysis” (the phrase “objective analysis” includes sampling data, and discounts any background groundwater conditions which may be under, in or reasonably predicted to enter under the HS Property, and may include but not be limited to modeling, and/or a risk assessment for analysis of groundwater impacts) that Alternate Cleanup Levels (ACLs) will be met at the GMZ boundary subject to the approval of USEPA, after an opportunity for review and comment by IEPA; or, makes a technical impracticability demonstration, and said demonstration is accepted by USEPA, after an opportunity for review and comment by IEPA. Below is a narrative of the anticipated steps required in this approved RAPFD process.

If, after implementation of the RA, HS achieves consistent and repeated asymptotic sampling results (e.g., soil vapor results from the AS/SVE System; contaminant removal and/or degradation rates achieved from an approved alternative measure) while active remediation (e.g., in the case of SVE/AS operating systems at various pulse rates) at the source area is ongoing, then HS may perform an objective analysis.

- If the objective analysis indicates concentrations in soil (or leachate) will be at or below (ACLs) at the GMZ boundary, then HS may submit a Shutdown/Monitoring Workplan (Workplan) for the source area(s). This Workplan may include a proposal for limited field investigations/data collection and an evaluation of existing groundwater, soil, and soil vapor extraction data. If this evaluation and subsequent monitoring confirms that criteria will be met (e.g., ACLs at HS boundary), then HS may petition USEPA after an opportunity for review and comment by IEPA to shut down appropriate system(s).
- If this evaluation and subsequent monitoring confirms that criteria will not be met (e.g., exceedances of ACL at HS boundary) then the remedial action shall continue and be re-evaluated through the RAPFD process.
- If this evaluation and subsequent monitoring confirms that criteria will be met (e.g., ACLs met at HS boundary), then HS may petition to shut

down appropriate system(s). Limited monitoring may continue for a specified period as approved by USEPA after an opportunity for review and comment by IEPA.

- If the objective analysis indicates concentrations in soil (or leachate) will not be at or below the ACLs at the GMZ boundary, then HS shall evaluate and propose Alternative Measure(s). If implemented, the sampling results of the Alternative Measures shall continue to be evaluated under an objective analysis process described above and in the approved RAPFD process.

If, after implementation of the Remedial Action, HS does not achieve repeated and consistent asymptotic sampling results, and an objective analysis of sampling data shows:

- no adverse impact to groundwater and subsequent investigation/monitoring confirms that concentrations in soil or leachate will be at or below the ACL at the GMZ boundary, then HS may petition USEPA, after an opportunity for review and comment by IEPA, to shut down appropriate system(s); and
- an adverse impact to groundwater, then HS shall evaluate and propose Alternative Measure(s). The sampling results from implementation of the Alternative Measure(s) shall be re-evaluated under an objective analysis process described above and in the approved RAPFD process.

7.2 Alternative Remedial Measures

Alternative measures may be proposed by HS:

- to supplement and/or be undertaken in lieu of the active remedial measures in a source area;
- to implement additional corrective action; or
- to address additional contamination identified at the HS Property (e.g., as described in Section II.I. of the SOW) in a source area as described more specifically below.

Any alternative measure would be proposed in accordance with criteria set forth under 35 Illinois Administrative Code (35 IAC) 620.410 (*Groundwater Quality Standards for Class I: Potable Resource Groundwater*), and 35 IAC 620.450(a)(4)(B) (*Alternative Groundwater Quality Standards*) as allowed and as applicable. Any proposed alternative measure shall be implemented only as approved by the USEPA, after an opportunity for review and comment by IEPA, through an Explanation of Significant Differences (ESD) or a Nonsignificant or Minor Change to the ROD (i.e., not constituting a fundamental change to the ROD or the selected remedy) (USEPA

document 540-R-98-031, July 1999) or by less formal approval, as appropriate, to achieve the Performance Standards at such source area. Alternative measures may include, for example, implementing or varying the pulsing of a remediation system, utilizing chemical and/or biological enhancements, utilizing nitrogen and/or other reducing agents, performing electrical resistive heating, implementing one or more ICs, and/or installing/maintaining one or more engineered controls.

Based on the findings of the investigations discussed in Section 6 above, HS will conduct an objective technical evaluation to determine the most appropriate alternative measures in order to meet the Performance Standards at such newly discovered source area(s). HS will implement any such alternative measure approved by the USEPA after opportunity for review and comment by IEPA until the Performance Standards as described in Section 7.1 above have been met at such source area(s). HS may alternately propose, subject to the approval of USEPA, after opportunity for review and comment by IEPA, to utilize and maintain a remaining structure as an engineered control (appropriately supported by one or more institutional controls, and/or a risk assessment as may be required by USEPA, after opportunity for review and comment by IEPA, or at the voluntary election of HS indicating no unreasonable risk to human health or the environment) to allow residual impacts to remain in place without the need for active remediation measures.

In implementing required alternative measures based on investigation results, HS will coordinate, where possible, with the other source control activities underway at the Hamilton Sundstrand Property, such as those governing underground storage tanks and former waste storage areas, to minimize interference with remedial activities in place.

8.0 GROUNDWATER ASSESSMENT

8.1 Upgradient Conditions

It is important to note that impacted groundwater has been migrating onto the HS Plant #1 Facility from the SER site, and will continue to do so for an extended period of time as Areas 4, 7 and 11 are upgradient of the Facility.

The analytical results from immediately upgradient monitoring wells screened in the upper portion of the aquifer at the first encountered groundwater interface (30 to 35 feet bgs) indicate that elevated concentrations of COCs are present. These wells are SMW-1, SMW-2, SMW-3, MW-3FGA, MW-7FGA, MW-202, and MW203. The following constituents were detected in upgradient monitoring wells in the upper portion of the aquifer during the PDI activities:

- 1,1-DCA;
- 1,1-DCE;
- 1,2-DCE;
- PCE;
- 1,1,1-TCA;
- TCE;
- methylene chloride;
- chloroform; and
- DRO/JP-4.

In addition, the analytical results from the immediately upgradient monitoring wells in the intermediate (80 to 100 feet bgs, SMW-11R and SMW-13) and deep (120 to 140 feet bgs, SMW-12 and SMW-14) aquifer depth indicate that elevated concentrations of COCs are also present. The following constituents were detected in wells upgradient of the HS facility in the intermediate portion of the aquifer: 1,1-DCA; 1,2 DCE; PCE; 1,1,1-TCA; TCE; acetone; carbon tetrachloride; and chloroform. The following constituents were detected in wells immediately upgradient of the HS facility operations in the deep portion of the aquifer during the PDI activities: 1,1-DCA; 1,1-DCE; 1,2-DCE; PCE; 1,1,1-TCA; and TCE. The following chemicals have been detected in immediately upgradient wells at levels above the Class I groundwater remediation objectives:

- PCE;
- chloroform; and
- TCE.

Under the terms of the CD, HS is responsible for conditions originating from releases from its Facility operations, and not those conditions that result from migration of COCs onto the Facility from sources known or unknown. This includes the long term fate and transport of COCs from other source areas.

Groundwater conditions upgradient of the HS Plant #1 Facility will be evaluated as part of the RA activities. The identified upgradient wells of the Area 9/10 groundwater

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monitoring well network include but are not limited to SMW-1, SMW-2, SMW-19, MW-138, MW203, MW7-FGA and wells from an adjacent source area (Area 11). Periodic evaluation of concentrations of COCs identified in immediately upgradient wells will be performed as part of the GMZ monitoring activities. This evaluation will identify the potential migration of COCs from other areas to the Facility.

There are a number of other locations within southeast Rockford that contributed chlorinated volatile organic compounds (cVOCs) into the regional aquifer. Many of these potential sources were not identified as source areas but were addressed in the 205 year groundwater attenuation and monitoring period associated with the Operable Unit (OU-2) ROD dated September 29, 1995. Based on this extensive timeframe of groundwater movement and the fact that the facility and Area 9/10 are located downgradient or cross gradient from several of the source Areas (Area 4, 7 and 11) that will be addressed as part of the OU-3 ROD, there is concern associated with upgradient COC concentrations in groundwater.

Additional offsite, upgradient well information (analytical data and groundwater elevations) from other properties (including Source Areas 4, 7, and 11) will be obtained through the Freedom of Information Act (FOIA) as it becomes available or is voluntarily shared by the Agencies. The data set included in the monitoring program plus data from other areas will be used to better understand contributions of COCs onto the Facility.

Over time, impacted groundwater may migrate toward and into Area 9/10 from these and potentially other locations (as indicated by measurable concentrations of COCs in upgradient wells and COC concentrations above MCLs at well SMW-19). The results of the upgradient data may be used to determine the trend analysis of COCs from offsite sources and negotiate background cleanup objectives for the Facility. Mann-Kendall analysis may be used as one tool for determining the trend of upgradient COCs. If upgradient conditions do not appear to be adequately characterized, HS may propose installation of additional upgradient wells. Models that may be used for this evaluation include but are not limited to Bioplume III, Biochlor, Bioscreen, Natural Attenuation Software (NAS) or Modular 3-D Transport model (MT3D).

8.2 Aquifer Testing

The uppermost aquifer at the Site is the sand and gravel aquifer. The potentiometric surface level ranged between 30 and 33 feet bgs over the period May 2005 to February 2007. This level varies somewhat seasonally and appears to mirror the general rainfall pattern of the area. The average water level depth was approximately 32 feet bgs. The aquifer is greater than 100 feet in thickness at the Site. Recent data indicates the groundwater flow is to the west-southwest at a gradient of approximately 0.0008 ft/ft (0.6 ft / 715 ft in March 2006) toward the Rock River.

The hydraulic conductivity of the sand aquifer has been estimated to be approximately 1.22×10^{-3} cm/sec (CDM, FFS, 2000). The aquifer porosity was assumed to be 0.25 and the gradient 0.0066 ft/ft in the FFS. Using this hydraulic conductivity value and average porosity with the more recent hydraulic gradient data, it is estimated that the

average linear velocity (also referred to as groundwater seepage velocity) is approximately 4 feet per year, but may have varied historically.

8.3 Groundwater Management Zone

Establishing a GMZ for the HS Plant #1 facility within Area 9/10 was required as part of the Source Control ROD activities for OU-3 (May 2002) and as part of the RD activities. On May 16, 2008, IEPA approved the *Revised Groundwater Management Zone Application Remedial Design Area 9/10* and its associated Addendum dated March 31, 2008.

Per 35 Illinois Administrative Code (IAC) Part 620.250, for a GMZ to be established, the groundwater within the proposed GMZ must be managed to mitigate impairment caused by the release of contaminants from a site. Source removal actions to prevent additional contamination from reaching groundwater must occur along with groundwater management. Groundwater management to mitigate impairment can use various combinations of technology. These include techniques such as groundwater removal and in-situ treatment. However, any action must improve the quality of groundwater caused by the release of contaminants from the site.

The GMZ was proposed for the groundwater potential source areas identified at the facility which to date include the following:

- Outside Container Storage Area;
- 2000 LUST incident #20001409; and
- East South Alley – JP-4.

The GMZ will be modified, updated, and periodically reevaluated (as appropriate) to apply to any additional areas of impact identified at the facility by future investigation activities.

The GMZ is composed of two areas, GMZ 1 and GMZ 2, separated by the Illinois Central Railroad property. The overall horizontal extent of the GMZ is approximately 1235 feet east to west and 530 feet north to south on the western portion of the facility and 350 feet north to south on the eastern portion of the Site. The GMZ extends to a depth of approximately 45 feet bgs, to the elevation of 685 feet above mean sea level. The average depth to water over the period of May 2005 to February 2007 was approximately 32 feet. The horizontal and vertical extent of the GMZ is shown on Figures 4 through 7. The GMZ and air sparge wells cross section, which shows the placement of the air sparge wells with respect to the vertical limit of the GMZ, is provided as Figure 8.

The GMZ monitoring network will consist of thirteen (13) wells. These will include nine (9) existing wells and four wells to be installed. Existing wells SMW-1, SMW-2, SMW-19, MW203, and MW7-FGA will be on the upgradient side of the GMZ and existing wells SMW-4, SMW-8, SMW-20 and SMW-21 and the four (4) new wells (GMZ-1 through GMZ-4) will be on the downgradient side. These new wells will be installed as part of the RA activities. The locations of the existing and new GMZ

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monitoring wells are shown on Figure 7. Each of these wells has or will have a 15 foot long screen that will be set from approximately 30 feet to 45 feet bgs.

8.4 Upgradient and Background Wells

Two immediately upgradient wells are also proposed as part of the RA Phase I Investigation activities (Figure 1). These wells will be sampled for VOCs only after installation. Additional upgradient wells may also be proposed and added in the future. The monitoring frequency and parameters of interest of the two planned wells, and other wells that may be added, will be proposed after evaluation of the initial laboratory analytical results and reevaluated periodically.

8.5 Groundwater Monitoring

The details of the groundwater monitoring to be performed at the facility are specified in the Groundwater Monitoring Plan, which is provided in Appendix I, and in the RA Field Sampling Plan (FSP) to be submitted. The frequency of groundwater monitoring is also discussed in the Groundwater Monitoring Plan.

The sampling protocols to be used during the RA will include low flow sampling of monitoring wells for the first eight quarters. Low flow sampling will limit the amount of purge water requiring disposal during the two year quarterly sampling program. It will also limit the potential for interferences related to turbidity. The sampling equipment used in conjunction with low flow sampling will be positioned at approximately the mid-point of the screened interval of the monitoring wells.

Groundwater parameters consisting of temperature, pH, and specific conductivity will be monitored to confirm these parameters have stabilized prior to sampling. These protocols will be used unless an alternate method is approved by USEPA, in consultation with IEPA.

Chemical groundwater samples will be collected in 40-ml glass vials provided by the laboratory, and analyzed for VOCs via method 8260B.

Monitored natural attenuation (MNA) parameters will also be collected in order to establish baseline conditions for use in future evaluations. Field parameters will include dissolved oxygen (DO), oxygen reduction potential (ORP) and ferrous iron (using HACH kit).

Laboratory parameters will include alkalinity, nitrate/nitrite, sulfate, sulfite/sulfide, TOC, and methane, ethane, ethene, and hydrogen (if the site has a carbon source that will drive conditions to a sufficient reducing state to generate these gases).

9.0 INSTITUTIONAL CONTROLS

Within 10 days after USEPA approval of the Institutional Control (IC) Notice, HS will execute and record the Notice with the Winnebago County Recorder of Deeds (Appendix E of the CD). The Notice shall inform the public that the HS Property within Source Area 9/10 is part of an NPL Site that contains source contamination and contaminated groundwater, that USEPA selected a remedy for the NPL Site on June 11, 2002, and that HS has entered into a CD requiring implementation of the RA as well as certain land and groundwater restrictions to maintain the integrity and protectiveness of the remedy. ICs are those non-engineered instruments, such as administrative and/or legal controls, that help minimize the potential for human exposure to contamination and/or protect the integrity of a remedy by limiting land or resource use. These controls are also imposed on the title of the property to ensure that specific requirements and prohibitions are clearly identified to current and future owners.

Thereafter, HS will implement the ICs defined in the USEPA-approved 100% RD, Institutional Control Implementation and Assurance Plan, and/or Operation and Maintenance (O & M) Work Plan as required by the ROD, the CD, or the SOW. An IC will be imposed for the OSA cap (and if necessary for the loading dock area).

Several different types of institutional controls will be imposed on the property. These will consist of a groundwater use restriction, which will be developed in conjunction with the establishment of a groundwater management zone, a commercial/industrial land use restriction, and the designation of an engineered barrier. The IEPA Model Environmental Land Use Control form is provided as a reference document in Appendix J. The deed restrictions are anticipated to contain substantially similar information.

9.1 Groundwater Use Restriction and Groundwater Management Zone Development

A groundwater use restriction will be imposed on the deed for the Plant #1 facility. The restriction will prohibit the use of groundwater at the Site as a potable water source and ensure that any contaminated groundwater removed from the property will be properly managed and disposed.

HS has established an area-specific GMZ for the HS Property groundwater contaminant plumes in accordance with the provisions of 35 IAC Part 620. The GMZ was approved on May 16, 2008 in a letter from IEPA. Additional GMZ details are provided in Section 8.3.

9.2 Commercial / Industrial Land Use Restriction

A commercial/industrial land use restriction will be imposed on the deed of the HS Plant #1 property. This action will prohibit use of the property for residential purposes.

9.3 Engineered Barrier Designation

The clay cap to be constructed at the ground surface upon completion of the OSA excavation activities will be designated as an engineered barrier. The barrier will be identified, and management systems put into place, such that excavation or other facility operations will provide for the integrity of the clay cap. If excavation is required in the future within the boundaries of this area, specific safety precautions will need to be followed and the integrity of the cap restored upon completion of those activities. The condition of the engineered barrier will be periodically inspected and maintained to restore the condition of the barrier such that the integrity of the barrier can be certified.

HS may also propose additional engineered barriers (new or existing structures) to minimize the potential for exposure to contaminants at the facility, subject to the approval of USEPA, after opportunity for review and comment by IEPA.

10.0 MINIMIZATION OF IMPACTS

The remedial design has incorporated a number of factors to ensure minimization of impacts to the public and the environment. These include minimizing the public sensory perception of the remedial activities, reducing the potential for public nuisance conditions, and reducing the overall energy requirements for the remedial action construction and operation. In the sections below specific items are listed that were incorporated into the design.

10.1 Minimized Public Impacts

The AS/SVE and air treatment equipment will be housed in the water tank building rather than constructing a new building that would require use of additional natural resources, reduce the open area on the property, and may not be as visually aesthetic. Sound proofing will be incorporated into the building, as necessary, to avoid potential noise issues. GAC will be used to reduce air emission levels to below the 8 lbs/hour level, which minimizes air quality impacts.

10.2 Minimized Environmental Impacts and Sustainable Design

HS has used a matrix created by Illinois EPA, among other sources, to consider sustainable site assessment, planning and design, and cleanup practices in developing the RD and RA. This document, *Greener Cleanups Matrix*, is presented in Appendix K.

A number of sustainable design, energy efficiency, and conservation principles that have been incorporated into the RD and RA remedial design to date or are planned include but are not limited to:

- Modification of an existing structure rather than building new;
- Requesting contractors to use recycled materials (where possible and appropriate);
- Returning SVE condensate water to the subsurface;
- Efficient piping layout, effective piping size specification, and material selection;
- Evaluation of piping design to minimize friction loss and energy consumption;
- Implementing a cell approach to the treatment system to reduce necessary equipment size and associated energy consumption;
- Reuse of excavated trench material as backfill (as possible);



- Request asphalt to be recycled by contractor; and
- Conducting low-flow groundwater sampling to reduce waste generation and handling requirements.

As part of an ongoing sustainable design initiative, efforts will be made to identify other opportunities to reduce the environmental footprint of the RA during its implementation. HS will continue to monitor developments in the evolving area of green remediation and will assess new technologies and practices. HS may make proposals to minimize environmental impacts and apply best practices as practical with respect to green remediation.

11.0 PERMITS

11.1 Actions Subject To Permit Requirements

Certain activities to be undertaken in the implementation of the remedial design are subject to permit requirements. These activities include the following:

- Treatment system equipment area construction within the water tank building and associated craft work – subject to local permits and ordinances;
- Asphalt paving work – subject to local permits and ordinances;
- Return of condensate water to the aquifer through an air sparge point – subject to Class V injection permit requirements;
- Placement of HRC-X into the wells in the OSA - subject to Class V injection permit requirements;
- Waste disposal operations – subject to permits, permitted contractor operations, and proper authorization; and
- SVE air emissions – subject to air permit requirements [also subject to the facility Federally Enforceable State Operating Permit (FESOP) requirements].

Some of these activities (treatment system equipment area construction, asphalt paving work, return of condensate water to the aquifer, and placement of HRC-X into OSA wells), though subject to permit requirements, will be completed entirely on-site and therefore do not require acquisition of permits.

Soil and water from the OSA excavation activities will involve the transportation and disposal of material offsite. Similarly impacted soil at depth associated with the installation of the AS/SVE system will require offsite disposal. There will also be liquid wastes generated associated with the monitoring well network and periodic groundwater monitoring activities.

AS/SVE effluent shall be treated via installation of two granular activated carbon (GAC) units, if necessary. When the GAC units are employed the system monitoring for capture of VOC contaminants shall provide the basis for determination of their effectiveness and the necessity for and duration of their continued operation.

Effluent VOC contaminants withdrawn from the aquifer and soils by the operation of the air sparge and SVE well systems will meet required air permit limits. The vapor phase treatment system will consist of primary and secondary GAC units plumbed in series. The secondary carbon unit will act as a back up in the event VOC breakthrough occurs at the primary unit. The carbon units will be taken off line once

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effluent VOC concentrations no longer exceed permit required conditions. The layout of the GAC units within the treatment building is shown on Figure M1.

11.2 Permits Required

Required permits will be obtained from the appropriate agencies and entities. Waste disposal operations are subject to permits, permitted contractor operations, and proper authorization. A permit application will be submitted to the IEPA Division of Air Pollution Control to address air emissions that will result from operation of the SVE system. The permit will be issued to HS as an addendum to the facility's FESOP.



12.0 SCHEDULE FOR FIELD INVESTIGATION, RA CONSTRUCTION AND REPORTING

The target schedule of major RA milestones is provided on Figure 9. The field investigation activities schedule, discussed in the August 13, 2008 meeting between US EPA, IEPA, HS and Stantec, is subject to change based on the date of approval of this RAWP, and on weather conditions. Any such changes can subsequently impact certain dates such as those of milestone inspections.

SWMU and groundwater source investigation activities are also included in the schedule. These dates are subject to change based on accessibility of areas for investigation, which depend in part on the dates of dismantling of certain structures on the HS property within the Site.

13.0 SUPPORTING DOCUMENTATION

This RAWP has been prepared to detail the performance of the RA at the facility. In addition to the detailed description of all currently planned remediation and construction activities (Sections 2-12), the RAWP includes target project schedules for each major activity and submission of deliverables (Figure 9) to be generated during the RA. HS is submitting this RAWP in accordance with the timetable set forth in Section V of the SOW. Supporting documents for this RAWP include the following.

13.1 Construction Quality Assurance Project Plan

The CQAP provides testing procedures and frequency for backfill materials including imported soil, soil placement, asphalt paving, concrete floor construction, and other construction activities. It also details the methodology by which the CQAP will be implemented. The CQAP is provided in Appendix L.

13.2 Health and Safety Plan

The Health and Safety Plan (HASP) for the SER Site has been updated and amended to incorporate the additional activities to be undertaken for the installation and construction of the remedial system infrastructure and the operation and maintenance of the system. The Health and Safety Plan is provided in Appendix M.

13.3 Groundwater Monitoring Plan

The Groundwater Monitoring Plan summarizes the methods by which groundwater will be monitored over the course of the RA. A description of the different groundwater monitoring well programs at the facility, the constituents of concern, hydrogeological setting, and the sampling methods and procedures to be used are summarized. Procedures for MNA evaluation are proposed and it is noted that MNA may be discussed with the USEPA and IEPA once parameters from the monitoring activities indicate the groundwater plume at the facility is stable or decreasing. Sampling of upgradient wells is discussed to assess the potential of COCs from other areas to migrate into the facility. In addition, the Plan details the content and frequency of reporting of monitoring results. The Groundwater Monitoring Plan is provided in Appendix I.

13.4 Contingency Plan

The Contingency Plan is designed to aid personnel engaged in the RA to respond quickly and effectively to accidental releases or emergency situations. Should a release or emergency situation occur, Stantec will take immediate action to mitigate the occurrence and will coordinate with appropriate agencies as required. The primary goal of the Contingency Plan is to provide a framework to limit the potential damage from a release while assuring the safety of all personnel and others who may be affected. This Contingency Plan provides a summary of the various remediation processes from which a release could occur, preventative measures to avoid/contain a release, the chain of command for addressing a release, corrective actions for



isolating, containing and remediating a release, and how these activities will occur within the context of the facility's existing emergency response structure. The Contingency Plan is provided in Appendix N.







TABLES

Table 1
Soil Sampling Methodology Comparison, Progression, and Monitoring Well Installation
UTC Hamilton Sundstrand, Plant 1 Facility
Southeast Rockford Groundwater Contamination Superfund Site, Rockford, IL

Methodology	Soil Screening	Additional Soil Screening (Option A only)	Soil Characterization	Soil Remedial Design	Groundwater Characterization	Approximate Investigation Duration (days)
Option A Direct Push w/ Closed Piston Sampling MW Installation: HSA	Complete 50 Direct Push holes at grid nodes (UNBIASED). Continuous soil sampling 1,500 ft @ 100 ft/day = 15 days Issue - possible refusal	NA	Conduct soil investigation of SWMUs and AOCs listed in ROD using direct push (10 total BIASED borings assumed for the 5 SWMUs in ROD). 10 holes x 30 ft = 300 ft / 100 ft/day = 3 days Issue - possible refusal Do soil characterization results necessitate supplementary investigation for extent determination or remedial design purposes?	Assumed that 15 holes (25% of 60 initial unbiased and biased holes) will be required for supplemental purposes 15 holes x 30 ft = 450 ft @ 100 ft/day = 4 5 days Issue - possible refusal	Install monitoring well transects in impacted and otherwise strategic areas using a drill rig and HSAs Install 10, 45 ft, 2-in diam MWs with 15 ft screens Assumed 2 wells installed per day = 5 days	28
Option B MIP and Direct Push MW Installation: HSA	Complete 50 MIP holes at grid nodes (UNBIASED), collecting ECD data Fifty 30 ft holes @ ~6 holes/day = 8 days Issue - possible refusal Issue - no samples for laboratory	Reduce ECD data Identify most impacted 20% of locations (10 locations) Sample at these locations using Direct Push for confirmatory analysis Issue - possible refusal Issue - possible caving 10 holes x 30 ft = 300 ft = 2 5 days	Conduct soil investigation of SWMUs and AOCs listed in ROD using direct push (10 total BIASED borings assumed for the 5 SWMUs in ROD) 10 holes x 30 ft = 300 ft / 125 ft/day = 2 5 days Issue - possible refusal Issue - possible caving Do soil characterization results necessitate supplementary investigation for extent determination or remedial design purposes?	Assumed that 15 holes (25% of 60 initial unbiased and biased holes) will be required for supplemental purposes Assumed 15 holes x 30 ft = 450 ft @ 125 ft/day = 4 days Issue - possible refusal Issue - possible caving	Install monitoring well transects in impacted and otherwise strategic areas using a drill rig and HSAs Install 10, 45 ft, 2-in diam MWs with 15 ft screens Assumed 2 wells installed per day = 5 days	22
Option C HSA with 2" split spoon and/or core-barrel sampler MW Installation: HSA	Complete 50 HSA borings at grid nodes (UNBIASED) Continuous soil sampling 1,500 ft @ 90 ft/day = 16 days Issue - slower Issue - volume of cuttings for disposal	NA	Conduct soil investigation of SWMUs and AOCs listed in ROD using direct push (10 total BIASED borings assumed for the 5 SWMUs in ROD) 10 borings x 30 ft = 300 ft / 90 ft/day = 3 5 days Issue - slower Issue - volume of cuttings for disposal Do soil characterization results necessitate supplementary investigation for extent determination or remedial design purposes?	Assumed that 15 holes (25% of 60 initial unbiased and biased holes) will be required for supplemental purposes 15 borings x 30 ft = 450 ft @ 90 ft/day = 5 days Issue - slower Issue - volume of cuttings for disposal	Install monitoring well transects in impacted and otherwise strategic areas using a drill rig and HSAs Install 10, 45 ft, 2-in diam MWs with 15 ft screens Assumed 2 wells installed per day = 5 days	30
Option D Sonic MW Installations: Sonic	Complete 50 Sonic holes at grid nodes (UNBIASED) Continuous soil sampling Fifty 30 ft holes @ ~4 holes/day = 12 days Issue - cost	NA	Conduct soil investigation of SWMUs and AOCs listed in ROD using direct push (10 total BIASED borings assumed for the 5 SWMUs in ROD) 10 holes x 4 holes/day = 2 5 days Issue - needs to be done in one mobilization Do soil characterization results necessitate supplementary investigation for extent determination or remedial design purposes?	Assumed that 15 holes (25% of 60 initial unbiased and biased holes) will be required for supplemental purposes 15 holes x 4 holes/day = 4 days Issue - needs to be done in one mobilization	Install monitoring well transects in impacted and otherwise strategic areas using a drill rig and HSAs Install 10, 45 ft, 2-in diam MWs with 15 ft screens Assumed 2 wells installed per day = 5 days Issue - cost	24

Notes:
MIP = Membrane Interface Probe
ECD = Electron Capture Device
SWMU = Solid Waste Management Unit
AOC = Area of Concern
HSA = Hollow Stem Auger
MW = Monitoring Well
NA = Not Applicable

Assumptions/Additional Considerations:
CS Drilling estimates 125 ft per day (~4 borings) or slightly more using direct push.
CS Drilling estimates 100 ft per day (3+ borings) using direct push with closed piston sampling
Stantec experience estimated 90 ft per day using HSA and split spoon and/or core-barrel sampler.
Boart Longyear estimates 4 sonic borings to 30 ft (~120 ft) per day



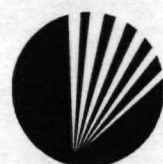


FIGURES

CERCLIS ID NO. ILD981000417

MARCH 2007

PREPARED BY



SECOR

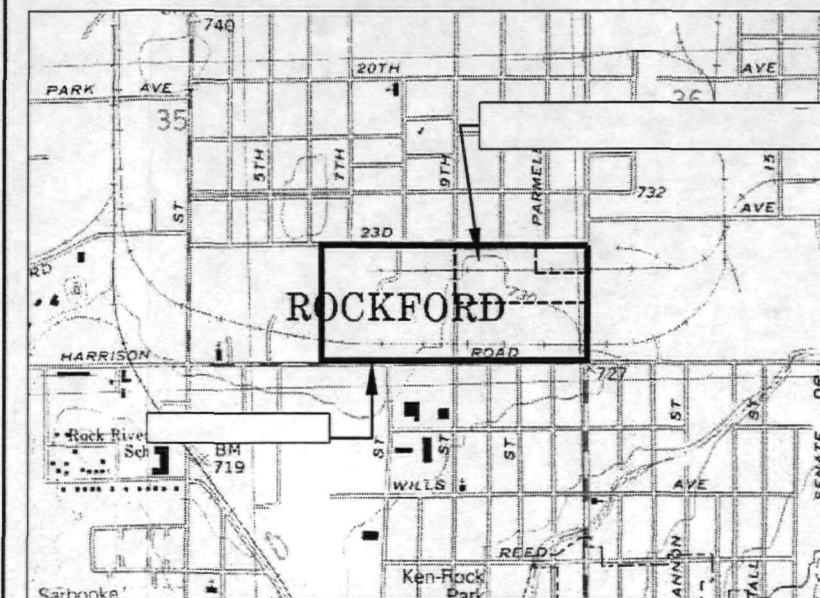
446 EISENHOWER LANE NORTH
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SECOR PN: 13UN.02072.04.0001

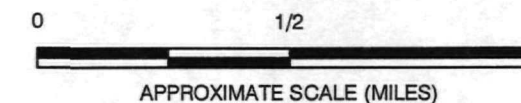


FINAL DESIGN 100% DESIGN

LOCATION MAP



REFERENCE: USGS 7.5 MINUTE QUADRANGLE: ROCKFORD SOUTH, ILLINOIS: 1993



QUADRANGLE LOCATION

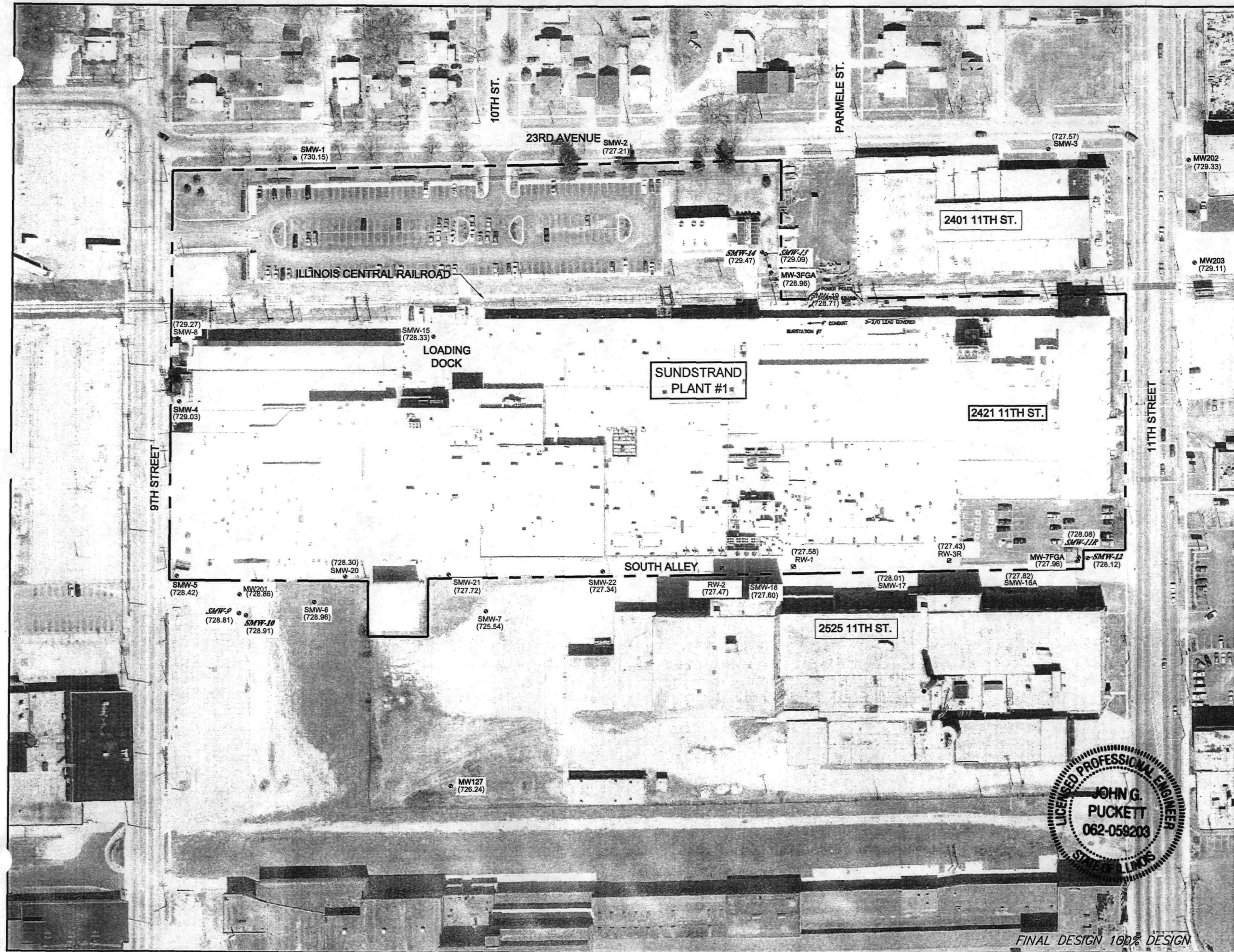
DRAWING INDEX

DRAWING NUMBER	TITLE AND DESCRIPTION
Y1	COVER SHEET AND AREA 9/10 SITE LOCATION
Y2	UTILITY AND PROPERTY OWNERSHIP MAP
Y3	WELL LOCATIONS AND GROUND SURFACE ELEVATIONS
Y4	GROUNDWATER AND SOIL REMEDIATION AREAS
Y5	AIR SPARGE AND SOIL VAPOR EXTRACTION TREATMENT SYSTEM DETAIL
Y6	WELL CONSTRUCTION DETAILS
Y7	CLAY CAP ENGINEERED BARRIER CROSS SECTION
P1	PIPING AND INSTRUMENTATION DIAGRAM LEGEND
P2	AIR SPARGE, SOIL VAPOR EXTRACTION, AND TREATMENT PIPING AND INSTRUMENTATION DIAGRAM
M1	AIR SPARGE AND SOIL VAPOR EXTRACTION AND AIR TREATMENT PLANT EQUIPMENT LAYOUT
M2	AIR SPARGE AND SOIL VAPOR EXTRACTION PIPING DETAILS
E1	ELECTRICAL SYMBOLS LEGEND
E2	ELECTRICAL ONE-LINE DIAGRAM

A		ISSUED FOR REVIEW				DESIGNED BY: KT
B		ISSUED FOR REVIEW				CHECKED BY: JC
O						APPROVED BY: DMC/KT
1						DRAWN BY:
REV	DATE	DESCRIPTION	DSGN	CHCK	APPRV	DATE: 3/28/

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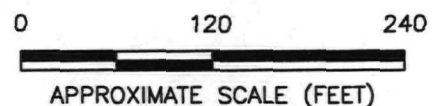


LEGEND:

- PROPERTY BOUNDARY
- MONITORING WELL
- RECOVERY WELL
- (327.72) ELEVATION AT WELL LOCATION

NOTE:

GROUND SURFACE ELEVATION RELATIVE TO MEAN SEA LEVEL, FROM APRIL 2004 SURVEY COMPLETED BY MISSMAN STANLEY AND ASSOCIATES, P.C. OF ROCKFORD, ILLINOIS.



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FOR:

AREA 9/10 REMEDIAL DESIGN
SOUTHEAST ROCKFORD GROUNDWATER
CONTAMINATION SUPERFUND SITE
ROCKFORD, ILLINOIS

TITLE:

**WELL LOCATIONS
AND GROUND SURFACE
ELEVATIONS**

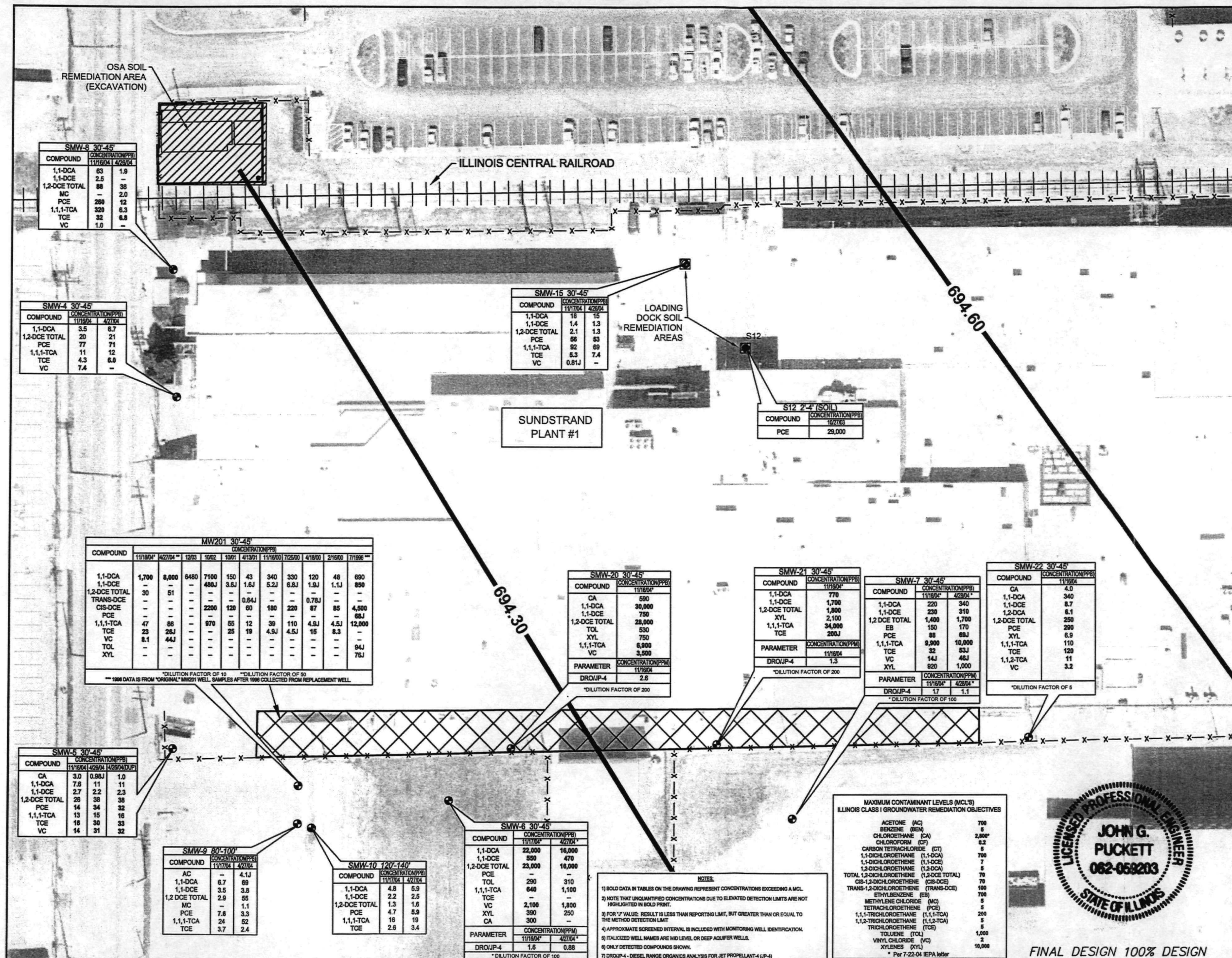
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CHECKED BY:	JGP	APPROVED BY:	DMC/KTW
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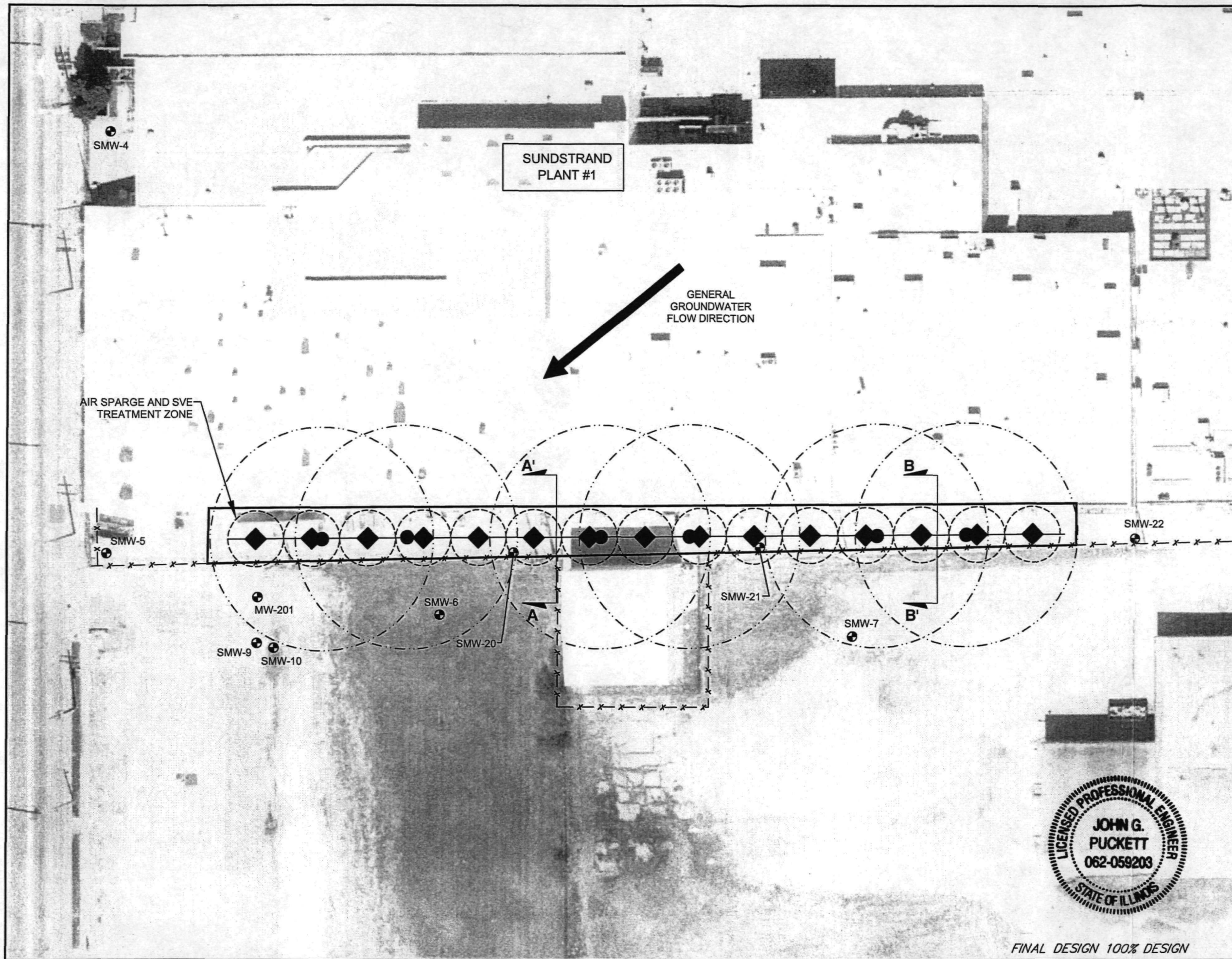
SHEET:

Y3



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LEGEND

- MONITORING WELL
- x— FENCE LINE
- SVE WELL
- ◆ AIR SPARGE WELL
- SVE RADIUS OF INFLUENCE
- - - AIR SPARGE RADIUS OF INFLUENCE
- ▭ AIR SPARGE AND SVE GROUNDWATER REMEDIATION TREATMENT ZONE

0 50 100
APPROXIMATE SCALE (FEET)

PREPARED BY:



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FOR:

AREA 9/10 REMEDIAL DESIGN
SOUTHEAST ROCKFORD GROUNDWATER
CONTAMINATION SUPERFUND SITE
ROCKFORD, ILLINOIS

TITLE:

**AIR SPARGE AND SOIL VAPOR
EXTRACTION TREATMENT
ZONE DETAILS**

DRAWN BY:

JC

DESIGNED BY:

JGP

CHECKED BY:

KTW

APPROVED BY:

DMC/KTW

PROJECT NUMBER:

13UN.02072.04

SCALE:

AS SHOWN

DATE:

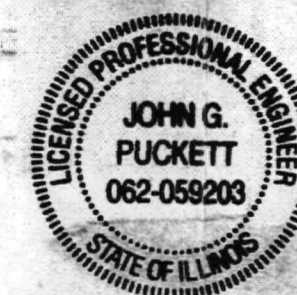
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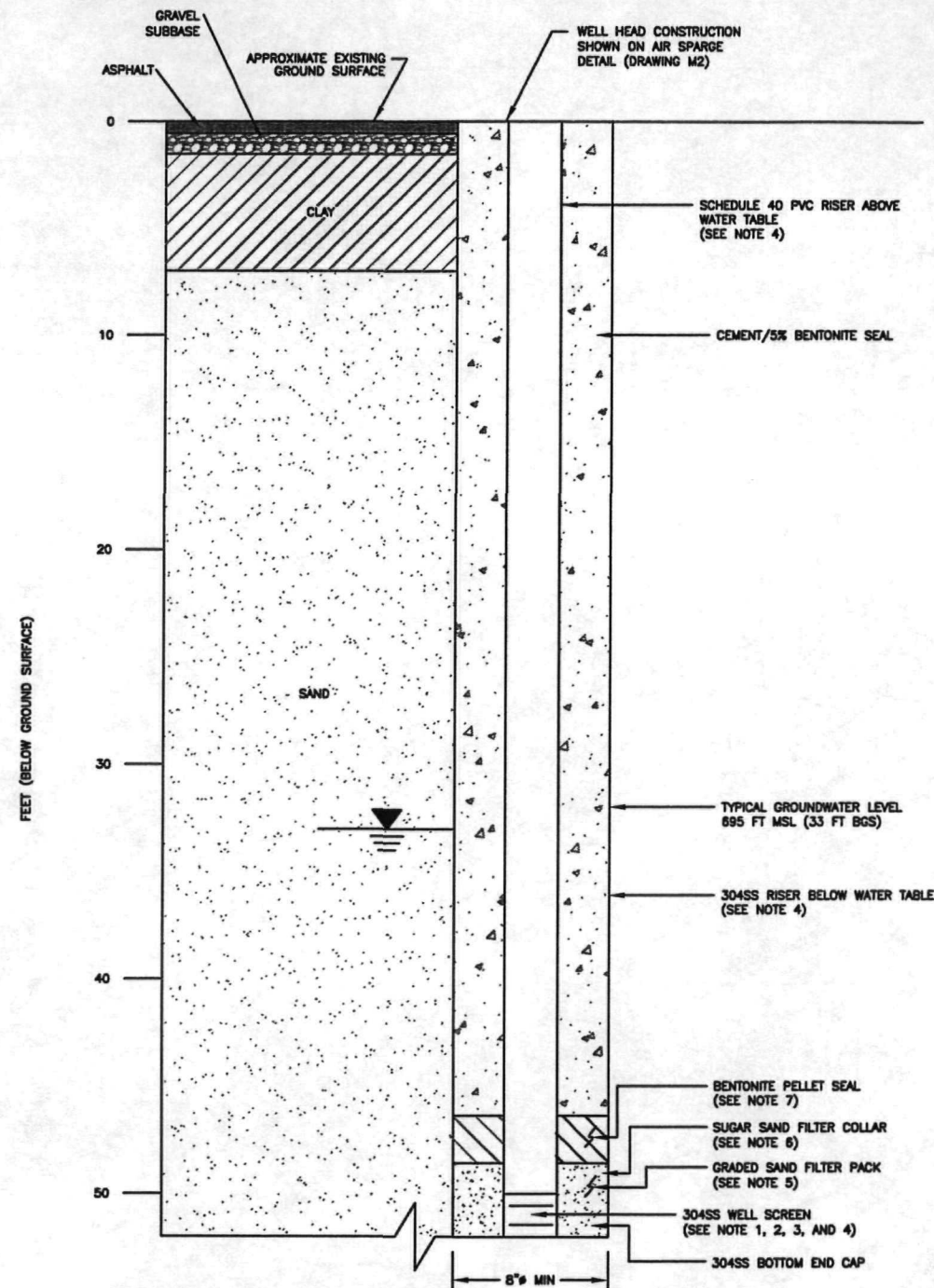
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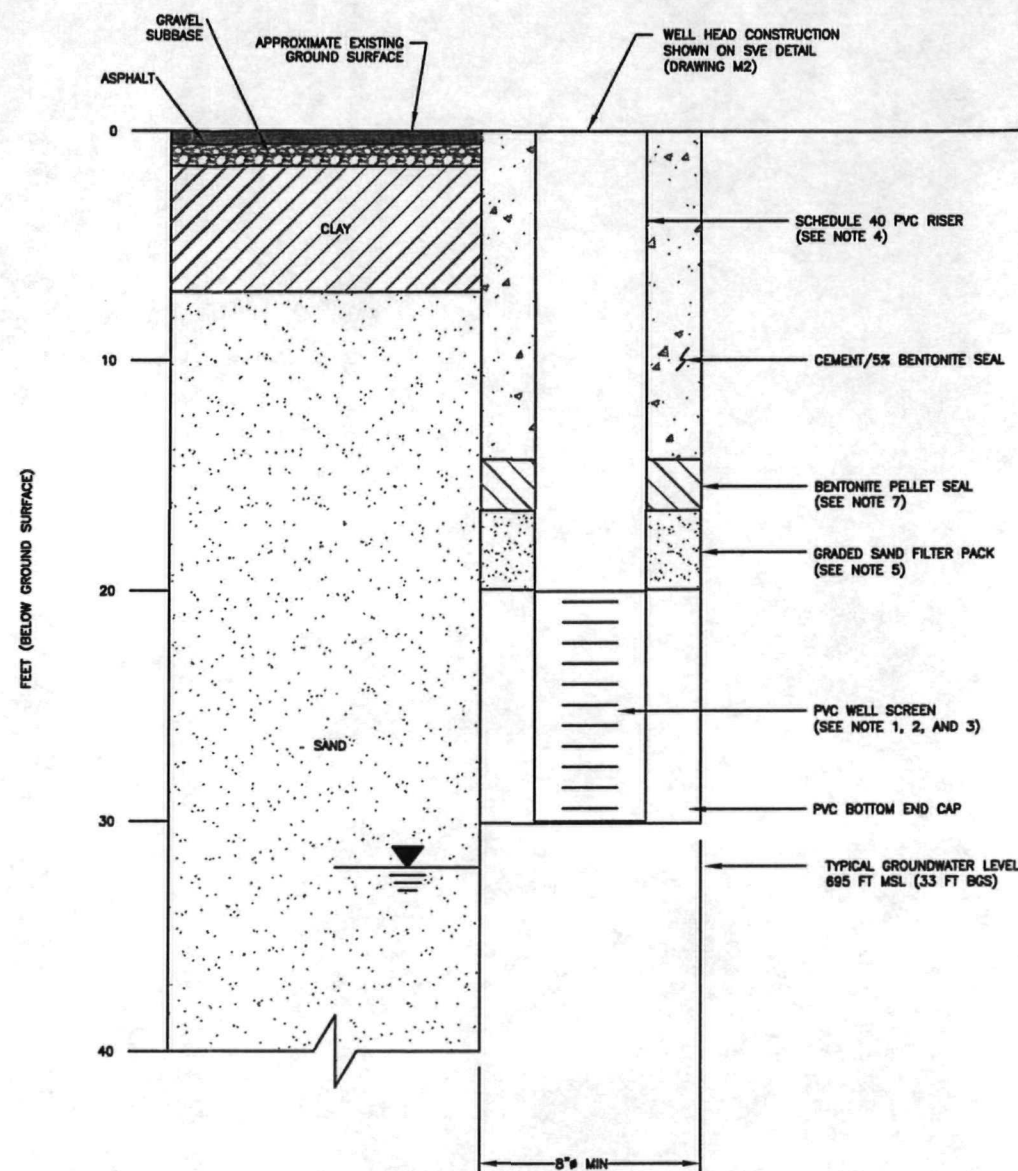
FINAL DESIGN 100% DESIGN



AIR SPARGE WELL CONSTRUCTION
NOT TO SCALE

NOTES:

1. WELL SCREEN APPROXIMATELY 50-52 FEET (ELEVATION 676-678 FT ABOVE MSL) APPROXIMATELY 17-19 FT BELOW THE TYPICAL WATER TABLE ELEVATION.
2. WELL SCREEN (2 FEET LENGTH) WILL BE INSTALLED
3. SCREEN SLOT SIZE WILL BE 0.010
4. WELL SCREEN AND RISER TO BE 1.5 INCH DIAMETER
5. FILTER PACK SAND WILL BE RED FLINT #3545 (OR EQUIVALENT)
6. A 1 FOOT SUGAR SAND FILTER COLLAR SAND WILL BE PLACED ABOVE THE FILTER PACK.
7. BENTONITE PELLET SEAL EXTENDS APPROXIMATELY 3 FEET ABOVE TOP OF FILTER COLLAR.
8. ACTUAL DEPTH TO BOTTOM OF BOREHOLE WILL BE DETERMINED BY GEOLOGIST/ENGINEER IN THE FIELD.



SOIL VAPOR EXTRACTION WELL CONSTRUCTION
NOT TO SCALE

NOTES:

1. WELL SCREEN APPROXIMATELY 20-30 FEET (ELEVATION 698-708 FT ABOVE MSL) APPROXIMATELY 3 FT ABOVE THE TYPICAL WATER TABLE ELEVATION.
2. WELL SCREEN (10 FEET LENGTH) WILL BE INSTALLED
3. SCREEN SLOT SIZE WILL BE 0.010
4. WELL SCREEN AND RISER TO BE 4 INCH DIAMETER
5. FILTER PACK SAND WILL BE RED FLINT #3545 (OR EQUIVALENT)
6. A 1 FOOT SUGAR SAND FILTER COLLAR SAND WILL BE PLACED ABOVE THE FILTER PACK.
7. BENTONITE PELLET SEAL EXTENDS APPROXIMATELY 3 FEET ABOVE TOP OF FILTER COLLAR.
8. ACTUAL DEPTH TO BOTTOM OF BOREHOLE WILL BE DETERMINED BY GEOLOGIST/ENGINEER IN THE FIELD.

FINAL DESIGN 100% DESIGN



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FOR:

AREA 9/10 REMEDIAL DESIGN
SOUTHEAST ROCKFORD GROUNDWATER
CONTAMINATION SUPERFUND SITE
ROCKFORD, ILLINOIS

TITLE:

WELL CONSTRUCTION DETAILS

DRAWN BY:

DESIGNED BY:

JC

KTW

CHECKED BY:

APPROVED BY:

JGP

DMC/KTW

PROJECT NUMBER:

SCALE:

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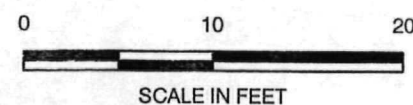
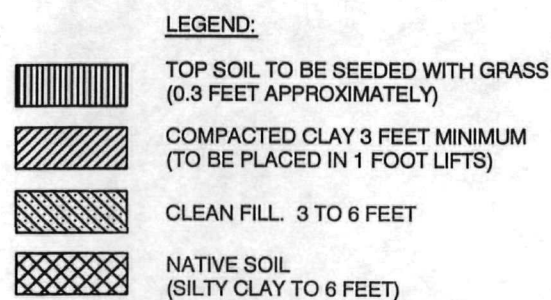
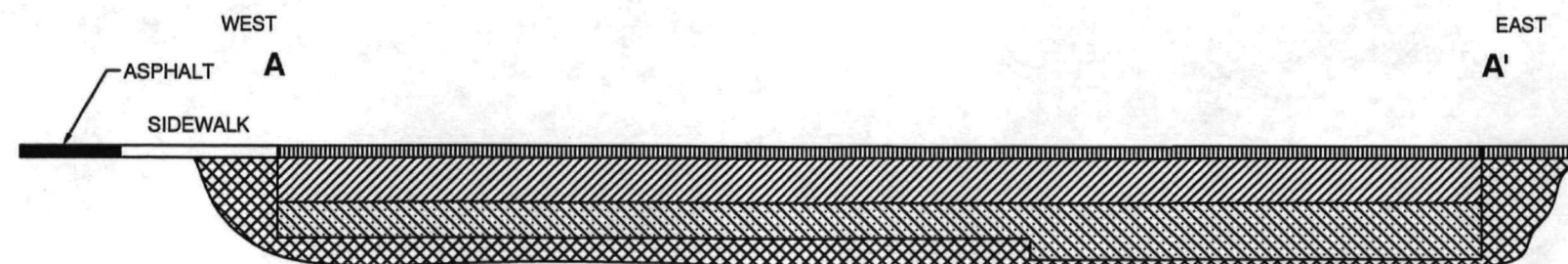
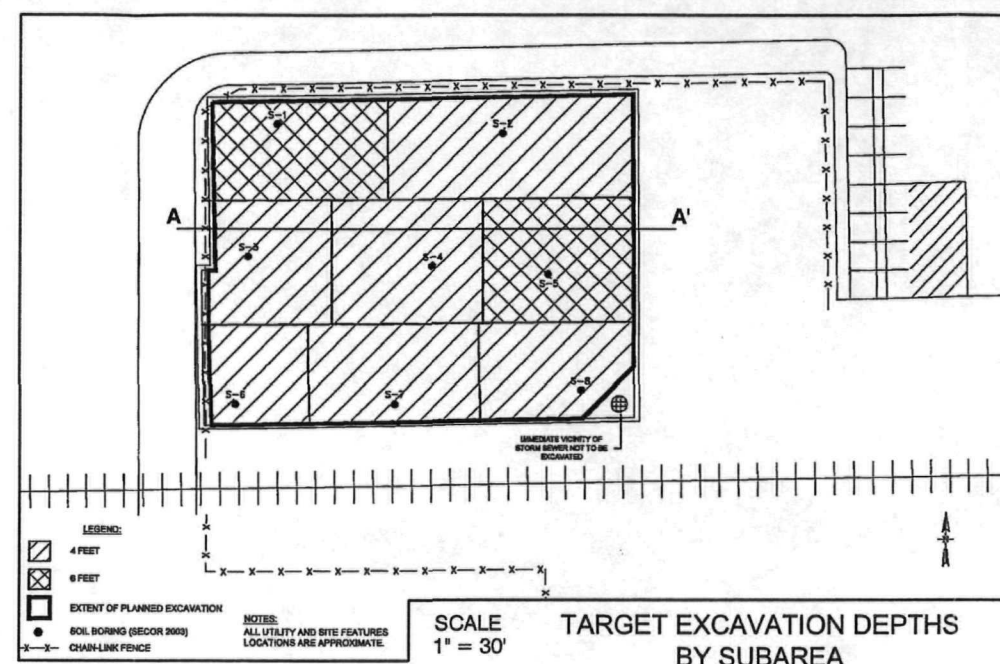
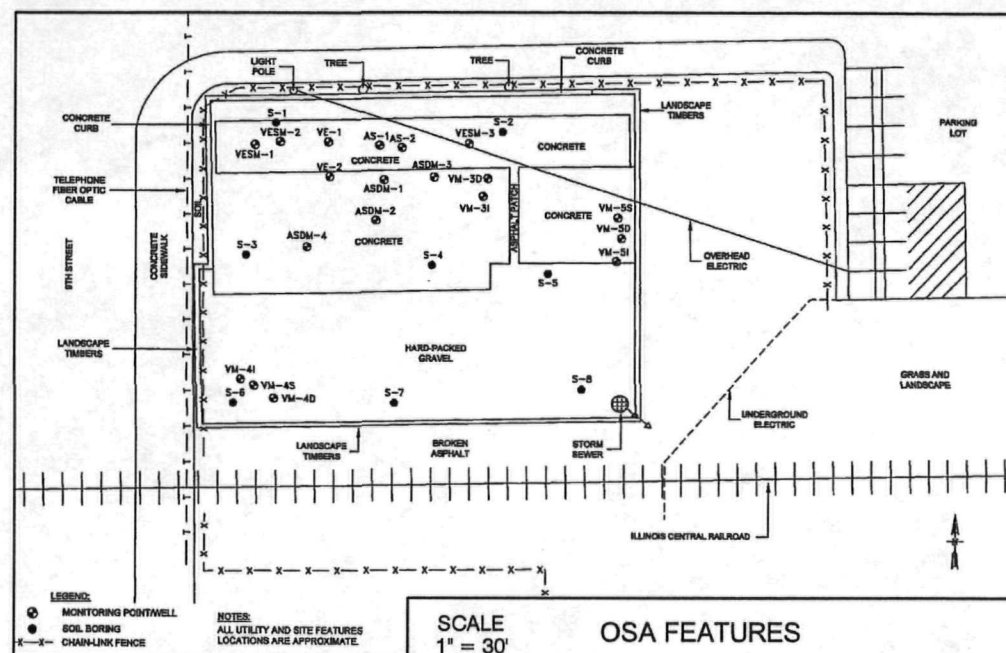
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FOR:

AREA 9/10 REMEDIAL DESIGN
SOUTHEAST ROCKFORD GROUNDWATER
CONTAMINATION SUPERFUND SITE
ROCKFORD, ILLINOIS

TITLE:

**CLAY CAP
ENGINEERED BARRIER
CROSS SECTION**

DRAWN BY:

DESIGNED BY:

JC

KTW

CHECKED BY:

APPROVED BY:

JGP

DMC/KTW

PROJECT NUMBER:

13UN.02072.04

DATE:

3/28/07

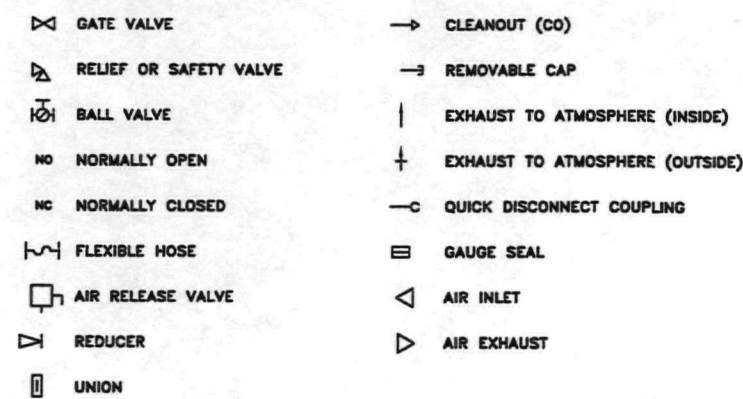
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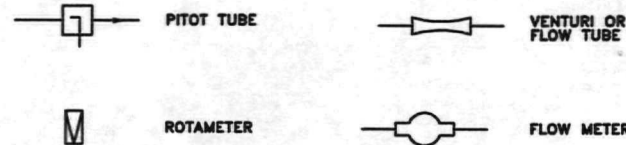
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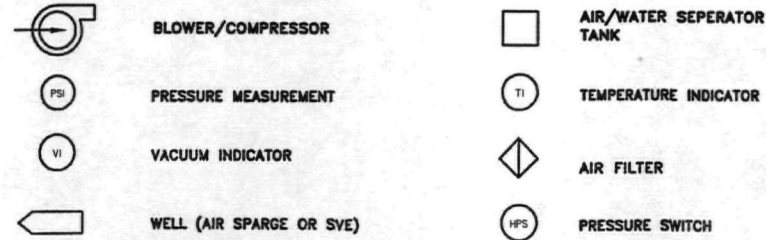
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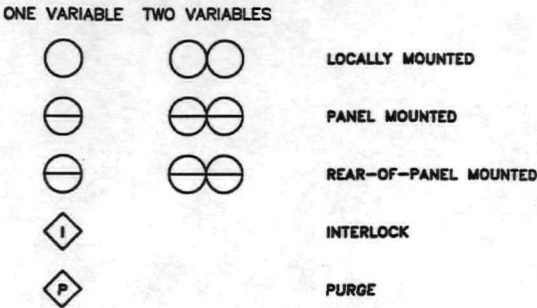
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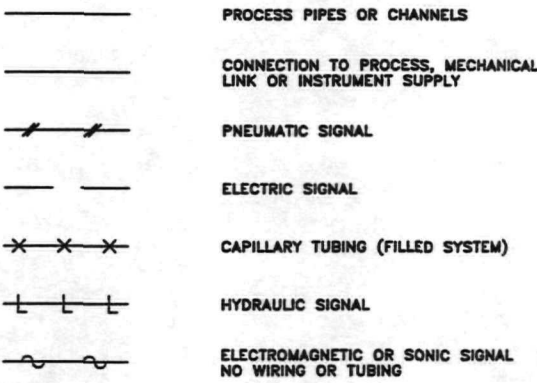
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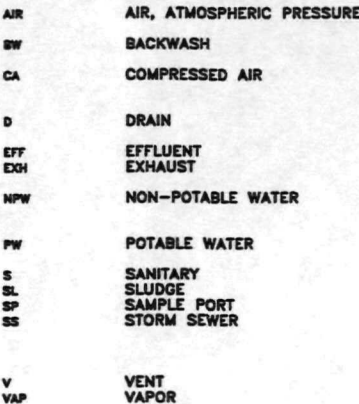
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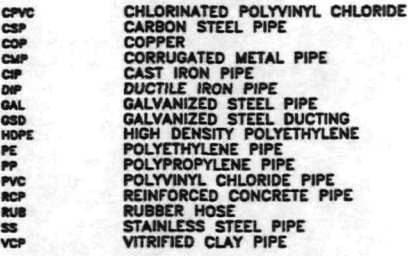
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PROCESS LINE ABBREVIATIONS



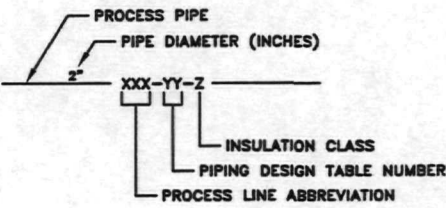
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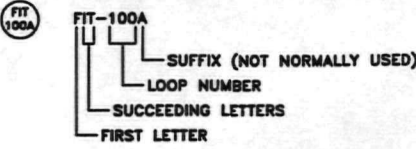
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MEASURED OR INITIATING VARIABLE	MODIFIER	READOUT OR PASSIVE FUNCTION	OUTPUT FUNCTION	MODIFIER	
A ANALYSIS		ALARM			
B BURNER FLAME					
C CONDUCTIVITY			CONTROL	CLOSED	
D DENSITY (SP. GR.)	DIFFERENTIAL				
E VOLTAGE		PRIMARY ELEMENT			
F FLOW RATE	RATIO				
G GAUGING (DIMENSIONAL)		GLASS			
H HAND (MANUAL)				HIGH	
I CURRENT		INDICATE			
J POWER	SCAN				
K TIME OR SCHEDULE			CONTROL STATION		
L LEVEL		LIGHT (PILOT)		LOW	
M MOISTURE OR HUMIDITY		MEASUREMENT		MIDDLE	
N NORMALLY					
O		ORIFICE			
P PRESSURE OR VACUUM		POINT (TEST)			
Q QUANT. OR EVENT	INTEGRATE				
R RADIOACTIVITY		RELIEF			
S SAMPLE	SAFETY		SWITCH		
T TEMPERATURE			TRANSMIT		
U MULTIVARIABLE		MULTIFUNCTION			
V VACUUM			VALVE OR DAMPER		
W WEIGHT OR FORCE		WELL			
X UNCLASSIFIED		UNCLASSIFIED			
Y			RELAY OR COMPUTE		
Z POSITION			DRIVE, ACTUATE		

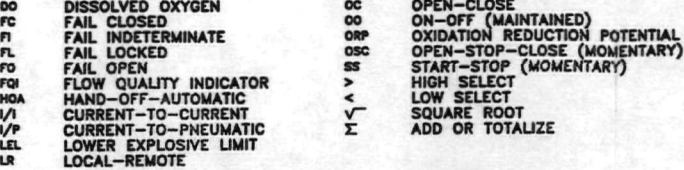
PROCESS PIPING IDENTIFICATION



INSTRUMENT IDENTIFICATION



FUNCTION ABBREVIATIONS

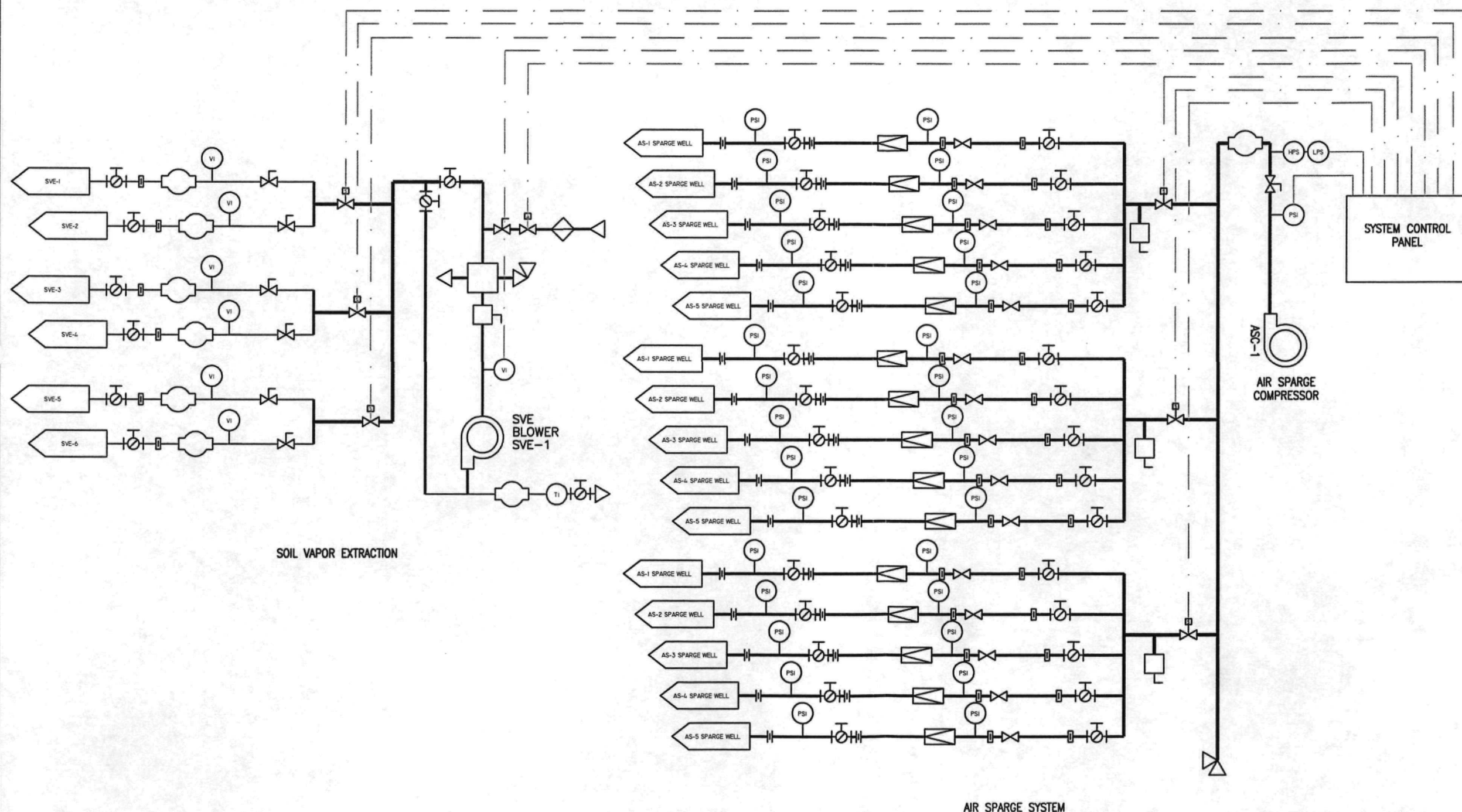


PREPARED BY:
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FOR:
AREA 9/10 REMEDIAL DESIGN
SOUTHEAST ROCKFORD GROUNDWATER
CONTAMINATION SUPERFUND SITE
ROCKFORD, ILLINOIS

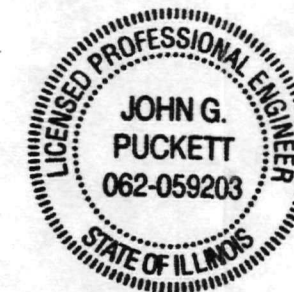
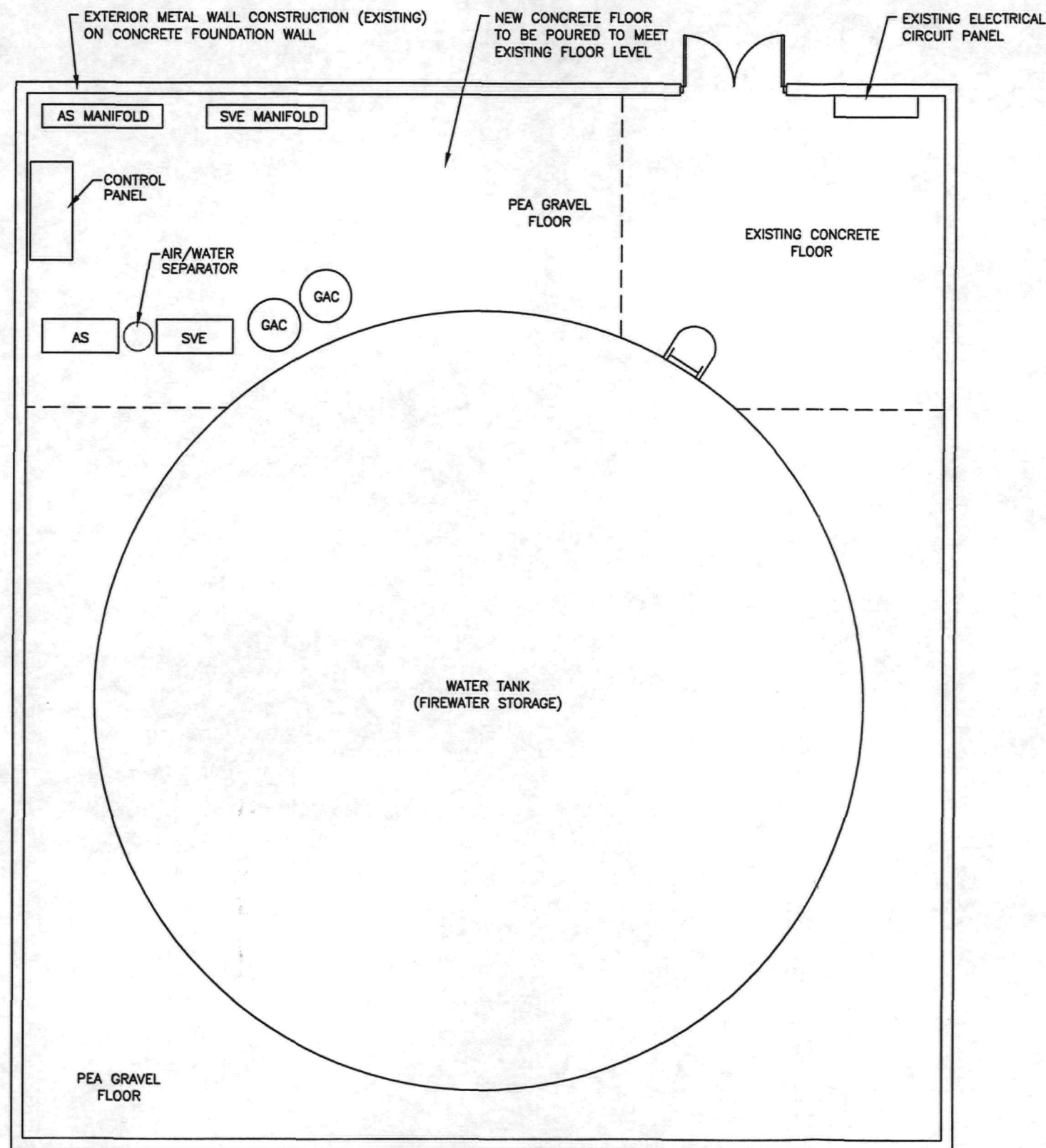
TITLE:
**PIPING AND INSTRUMENTATION
DIAGRAM LEGEND**

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CHECKED BY:	KTW	APPROVED BY:	DMC/KTW
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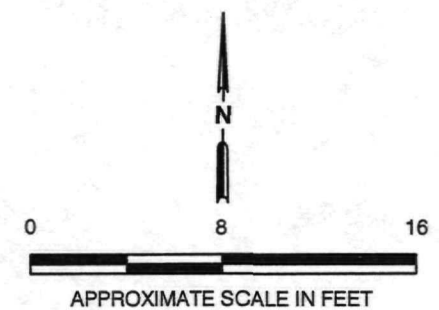


PREPARED BY:  SECOR 446 EISENHOWER LANE NORTH LOMBARD, ILLINOIS 60148 PHONE: (630) 792-1680/792-1691 (FAX)	
FOR: AREA 9/10 REMEDIAL DESIGN SOUTHEAST ROCKFORD GROUNDWATER CONTAMINATION SUPERFUND SITE ROCKFORD, ILLINOIS	
TITLE: AIR SPARGE, SOIL VAPOR EXTRACTION, TREATMENT PIPING AND INSTRUMENTATION DIAGRAM	
DRAWN BY: JC	DESIGNED BY: JGP
CHECKED BY: KTW	APPROVED BY: DMC/KTW
PROJECT NUMBER: 13UN.02072.04	SCALE: NTS
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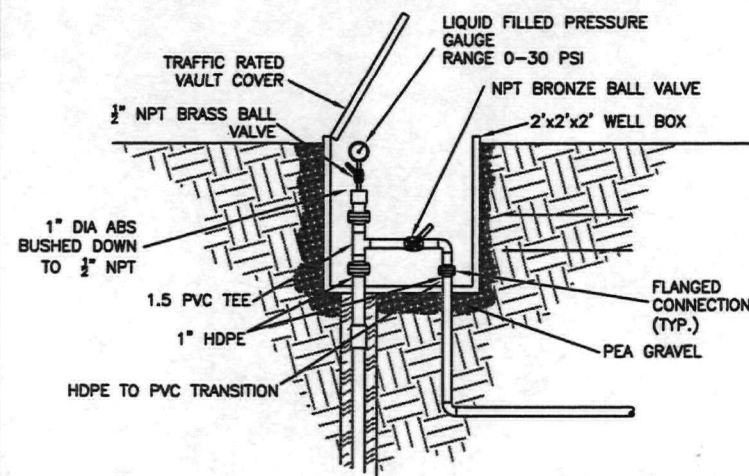
WATER TANK BUILDING



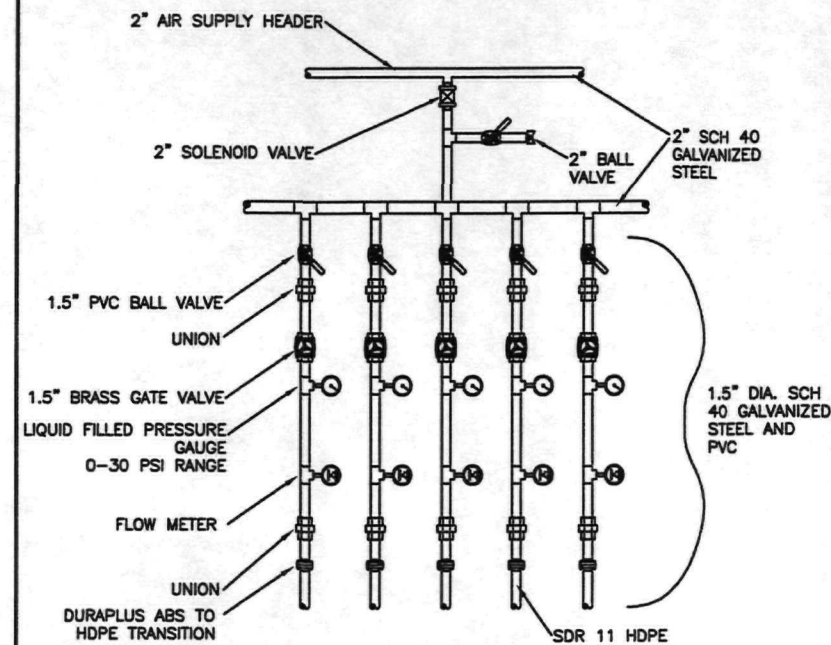
NOTES:
BUILDING DIMENTIONS TO BE OBTAINED FROM FIELD MEASUREMENTS OF THE WATER TANK BUILDING

PREPARED BY:		 SECOR 446 EISENHOWER LANE NORTH LOMBARD, ILLINOIS 60148 PHONE: (630) 792-1680/792-1691 (FAX)	
FOR:		AREA 9/10 REMEDIAL DESIGN SOUTHEAST ROCKFORD GROUNDWATER CONTAMINATION SUPERFUND SITE ROCKFORD, ILLINOIS	
TITLE:		AIR SPARGE, SOIL VAPOR EXTRACTION, AND AIR TREATMENT PLANT EQUIPMENT LAYOUT	
DRAWN BY:	JC	DESIGNED BY:	JGP
CHECKED BY:	KTW	APPROVED BY:	DMC/KTW
PROJECT NUMBER:	13UN.02072.04	SCALE:	AS SHOWN
DATE:	3/28/07	FILE PATH:	F:\WORK\AUTOCAD\FIGURES\UTC
SHEET:		M1	

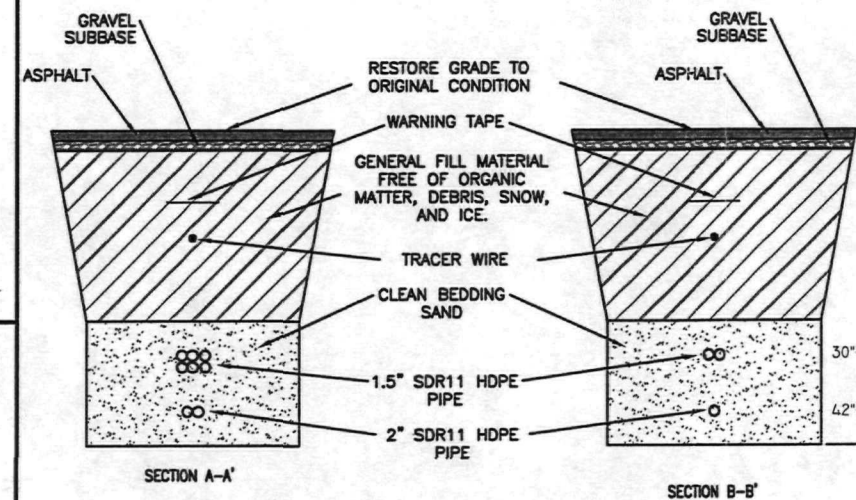
FINAL DESIGN 100% DESIGN



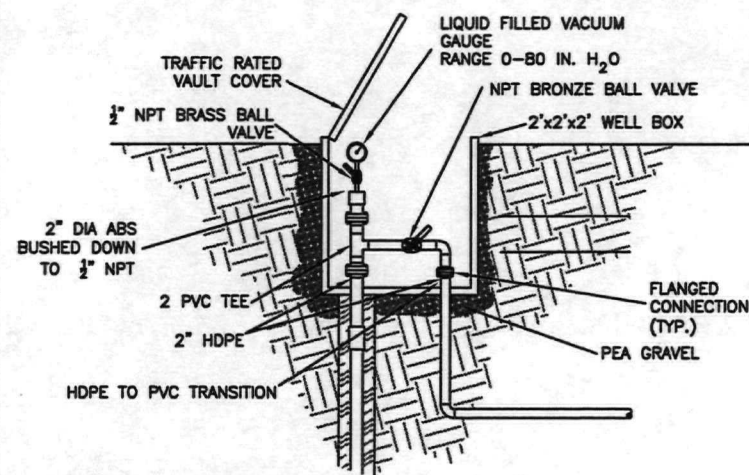
AIR SPARGE WELL HEAD
NOT TO SCALE



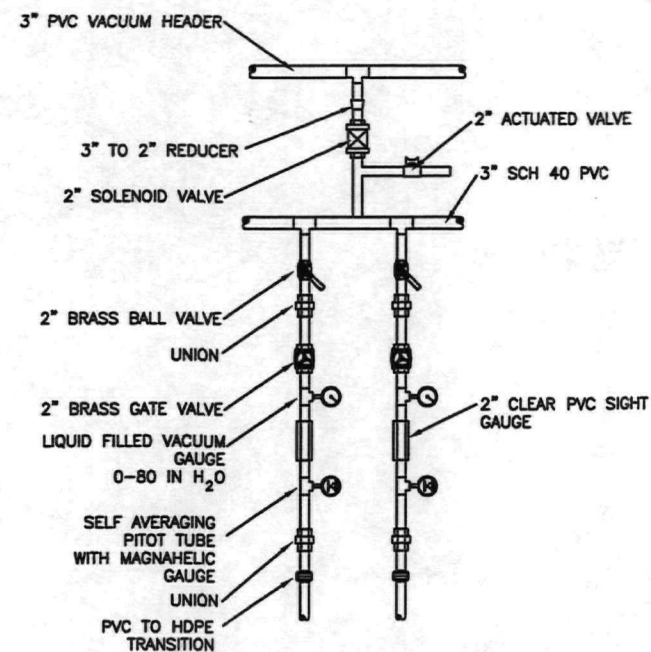
AIR SPARGE MANIFOLD DETAIL
NOT TO SCALE



TRENCH DETAIL
NOT TO SCALE



SVE WELL HEAD
NOT TO SCALE



SVE MANIFOLD DETAIL
NOT TO SCALE



PREPARED BY:



SECOR

446 EISENHOWER LANE NORTH
LOMBARD, ILLINOIS 60148
PHONE: (630) 792-1680/792-1691 (FAX)

FOR:

AREA 9/10 REMEDIAL DESIGN
SOUTHEAST ROCKFORD GROUNDWATER
CONTAMINATION SUPERFUND SITE
ROCKFORD, ILLINOIS

TITLE:

**AIR SPARGE AND SOIL VAPOR
EXTRACTION PIPING DETAILS**

DRAWN BY:

DESIGNED BY:

JC

JGP

CHECKED BY:

KTW

APPROVED BY:

DMC/KTW

PROJECT NUMBER:

13UN.02072.04

SCALE:

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DATE:

3/28/07

FILE PATH:

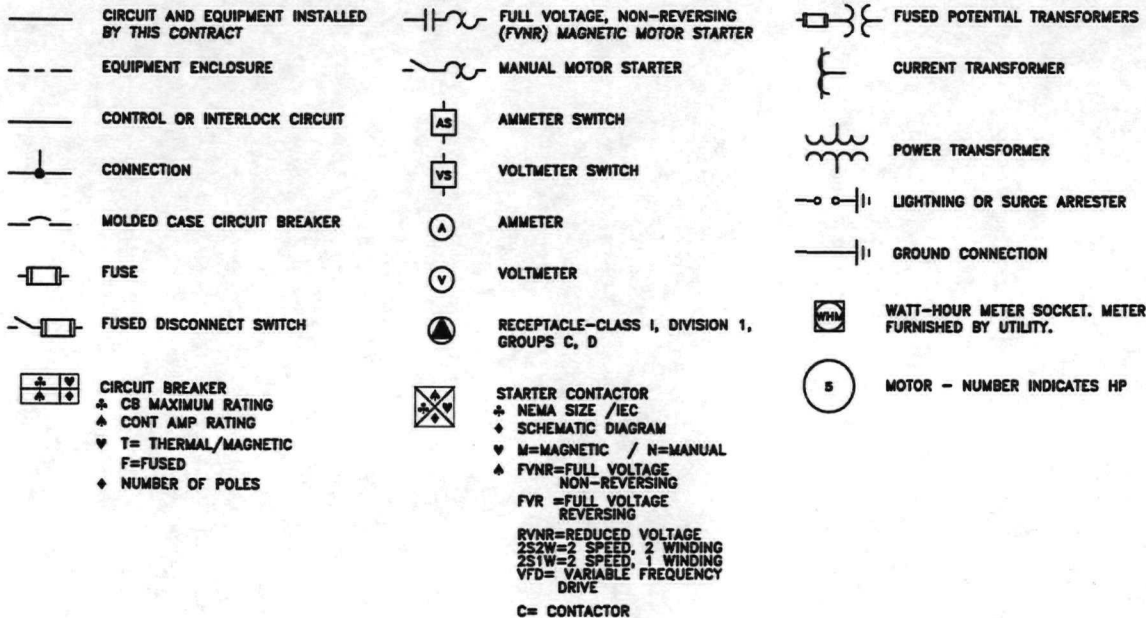
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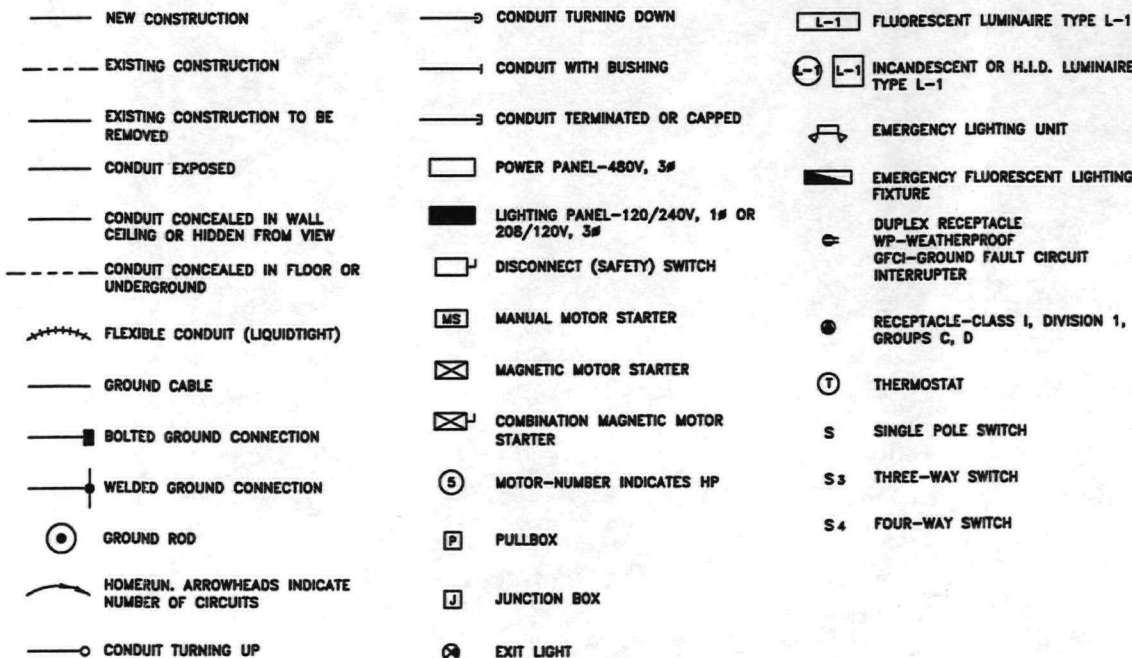
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FINAL DESIGN 100% DESIGN

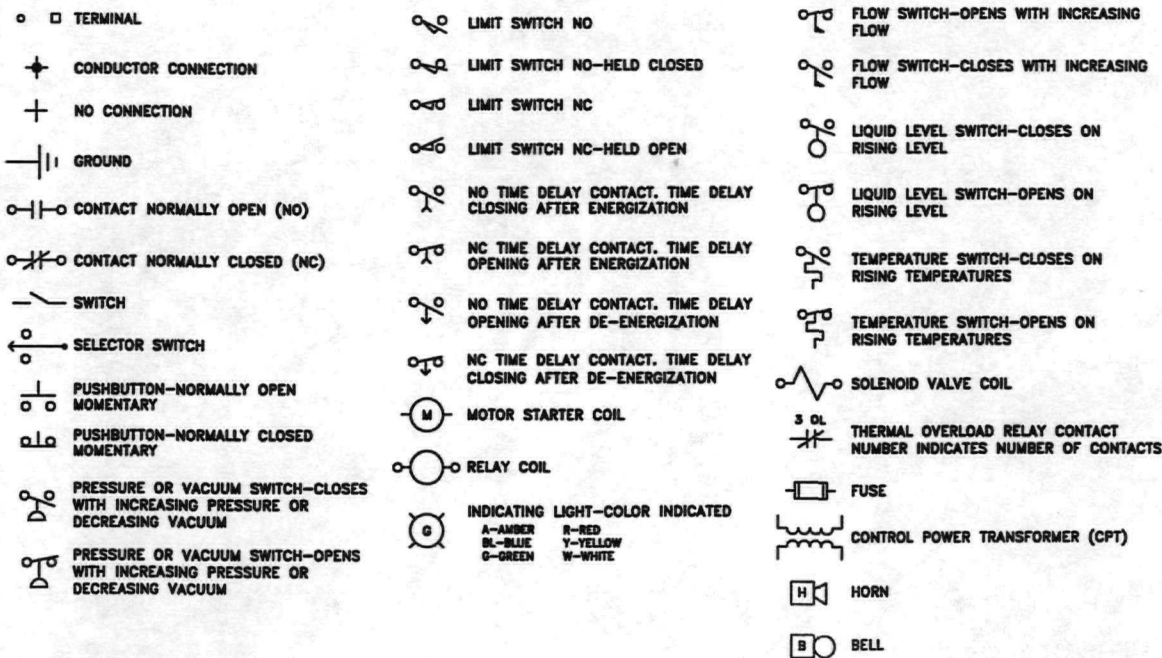
ONE-LINE DIAGRAM SYMBOLS



PLAN SYMBOLS



SCHEMATIC DIAGRAM SYMBOLS



GENERAL ABBREVIATIONS

A, AUTO	AUTOMATIC	H	HAND	PLC	PROGRAMMABLE LOGIC CONTROLLER
ACK	ACKNOWLEDGE	HI	HIGH	REM	REMOTE
AFF	ABOVE FINISH FLOOR	HS	HIGH SPEED	REV	REVERSE
AFG	ABOVE FINISH GRADE	IL	INDICATING LIGHT	SOL	SOLENOID (OTHER THAN VALVE)
BC	BARE COPPER	INST	INSTANTANEOUS	SP	SPARE
C	CONDUIT	L	LOW	SS	SELECTOR SWITCH
CB	CIRCUIT BREAKER	LOC	LOCAL	SV	SOLENOID VALVE
CL	CLOSE	LS	LOW SPEED	T, T-STAT	THERMOSTAT
CPT	CONTROL POWER TRANSFORMER	MAN	MANUAL	TDAE	TIME DELAY AFTER ENERGIZATION
CR	CONTROL RELAY	MCC	MOTOR CONTROL CENTER	TDAD	TIME DELAY AFTER DE-ENERGIZATION
CS	CONTROL SWITCH	NC	NORMALLY CLOSED	TDR	TIME DELAY RELAY
CT	CURRENT TRANSFORMER	NL	NIGHT LIGHT (UNSWITCHED FIXTURE)	TEMP	TEMPERATURE
DWG	DRAWING	NO	NORMALLY OPEN	TMR	TIMER
ETM	ELAPSED TIME METER	O	OFF	WP	WEATHERPROOF
FU	FUSE	OL	THERMAL OVERLOAD RELAY	XFMR	TRANSFORMER
FWD	FORWARD	OP	OPEN	XP	EXPLOSIONPROOF-CLASS I, DIVISION I, GROUPS C, D
GND	GROUND	PB	PUSHBUTTON		

PREPARED BY:



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LOMBARD, ILLINOIS 60148
PHONE: (630) 792-1680/792-1691 (FAX)

FOR:

AREA 9/10 REMEDIAL DESIGN
SOUTHEAST ROCKFORD GROUNDWATER
CONTAMINATION SUPERFUND SITE
ROCKFORD, ILLINOIS

TITLE:

ELECTRICAL
SYMBOLS LEGEND

DRAWN BY:

JC

DESIGNED BY:

JGP

CHECKED BY:

KTW

APPROVED BY:

DMC/KTW

PROJECT NUMBER:

13UN.02072.04

SCALE:

NTS

DATE:

3/28/07

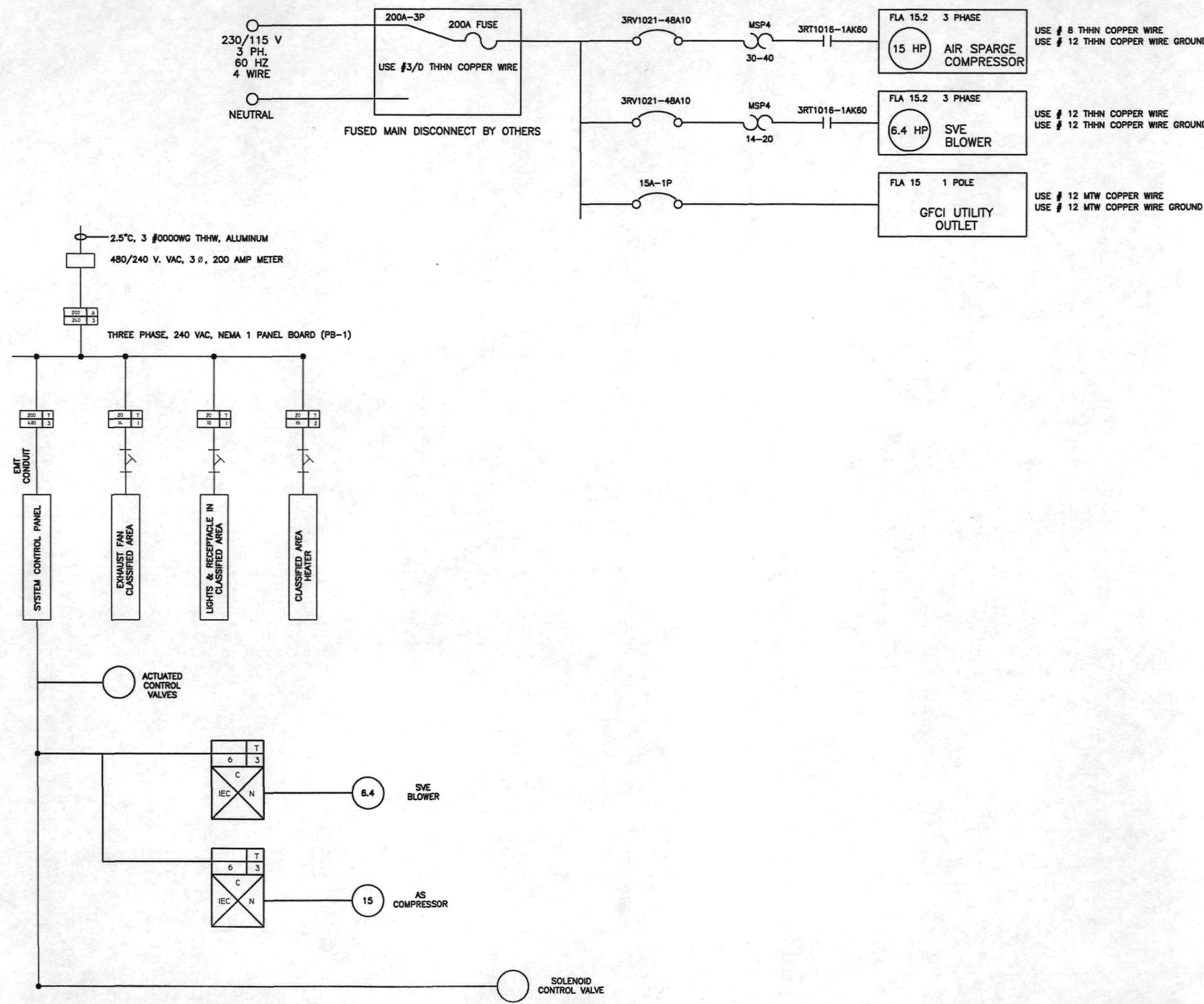
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SHEET:

E1

FINAL DESIGN 100% DESIGN



NOTES:

- 1.) ALL INSTRUMENTATION TO BE CONNECTED TO CONTROL PANEL USING 1/2" EMT CONDUITS WITH SEAL-OFFS
- 2.) SEAL-OFFS TO BE POURED AFTER FINAL INSPECTION

PREPARED BY:



SECOR

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FOR:

AREA 9/10 REMEDIAL DESIGN
SOUTHEAST ROCKFORD GROUNDWATER
CONTAMINATION SUPERFUND SITE
ROCKFORD, ILLINOIS

TITLE:

**ELECTRICAL
ONE-LINE DIAGRAM**

DRAWN BY:

DESIGNED BY:

JC

JGP

CHECKED BY:

KTW

APPROVED BY:

DMC/KTW

PROJECT NUMBER:

13UN.02072.04

SCALE:

NTS

DATE:

3/28/07

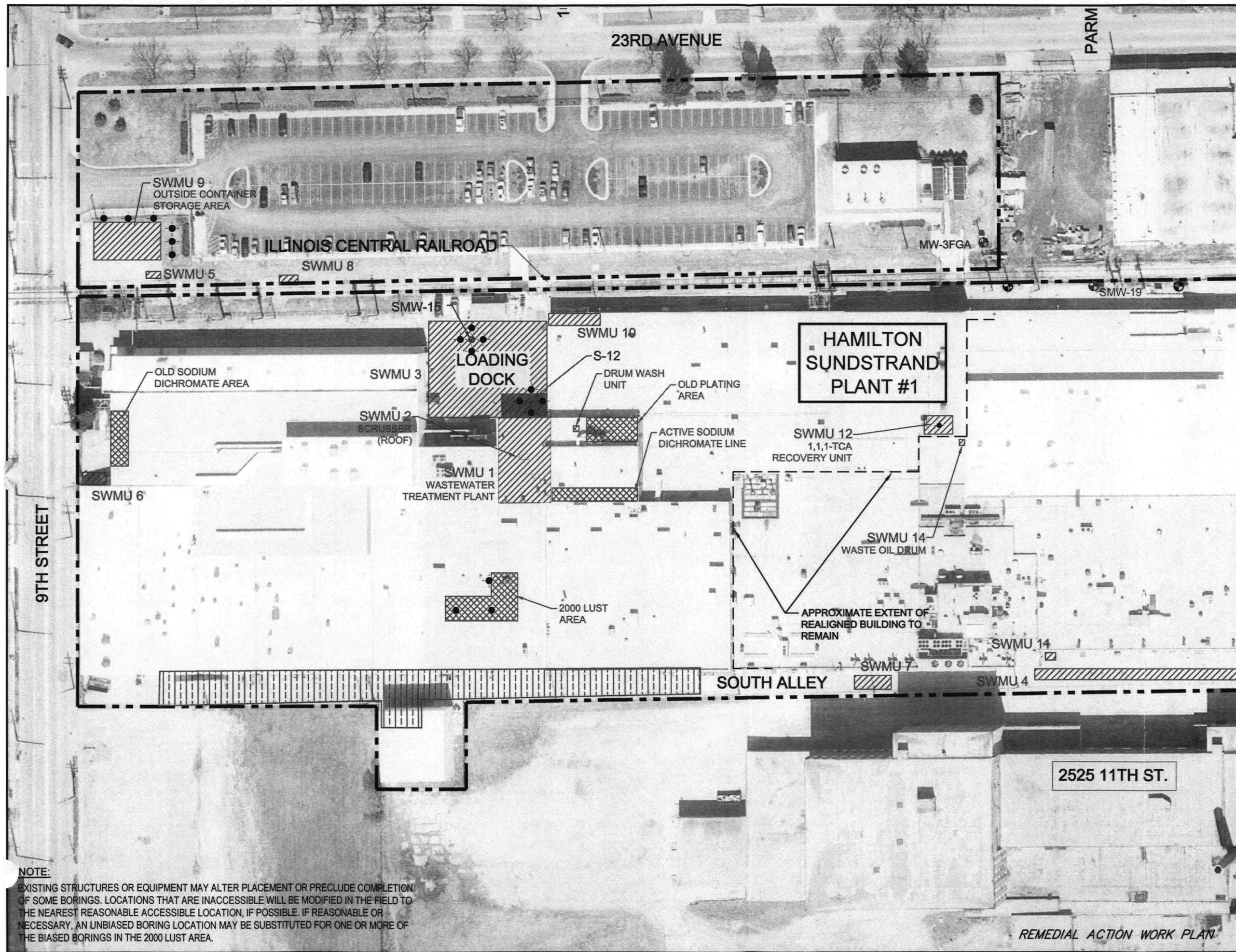
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SHEET:

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FINAL DESIGN 100% DESIGN



NOTE:

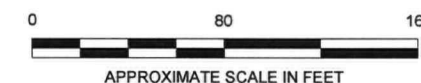
EXISTING STRUCTURES OR EQUIPMENT MAY ALTER PLACEMENT OR PRECLUDE COMPLETION OF SOME BORINGS. LOCATIONS THAT ARE INACCESSIBLE WILL BE MODIFIED IN THE FIELD TO THE NEAREST REASONABLE ACCESSIBLE LOCATION, IF POSSIBLE. IF REASONABLE OR NECESSARY, AN UNBIASED BORING LOCATION MAY BE SUBSTITUTED FOR ONE OR MORE OF THE BIASED BORINGS IN THE 2000 LUST AREA.

LEGEND:

- PROPERTY BOUNDARY
- PROPOSED BORING LOCATION
- ⊕ PROPOSED MONITORING WELL
- S-12 ● EXISTING BORING LOCATION
- SMW-15 ● EXISTING MONITORING WELL
- ▨ SWMU LOCATION
- ▩ AREA OF CONCERN (AOC)
- ▤ PLANNED SVE AND AIR SPARGE REMEDIATION SYSTEM TO ADDRESS SWMU 13 (ONSITE GROUNDWATER CONTAMINATION)

NOTE:

SWMU AND AOC LOCATIONS ARE APPROXIMATE



PREPARED BY:



Stantec

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LOMBARD, ILLINOIS 60148
PHONE: (630)792-1680 FAX: (630)792-1691

FOR:

AREA 9/10 REMEDIAL ACTION
SOUTHEAST ROCKFORD GROUNDWATER
CONTAMINATION SUPERFUND SITE
ROCKFORD, ILLINOIS

TITLE:

**PROPOSED BIASED BORING AND
MONITORING WELL LOCATIONS
PHASE I INVESTIGATION**

DRAWN BY:

JC

DESIGNED BY:

JD

CHECKED BY:

JD

APPROVED BY:

KTW

PROJECT NUMBER:

13UN.02072.08.0105

SCALE:

AS SHOWN

DATE:

9/15/08

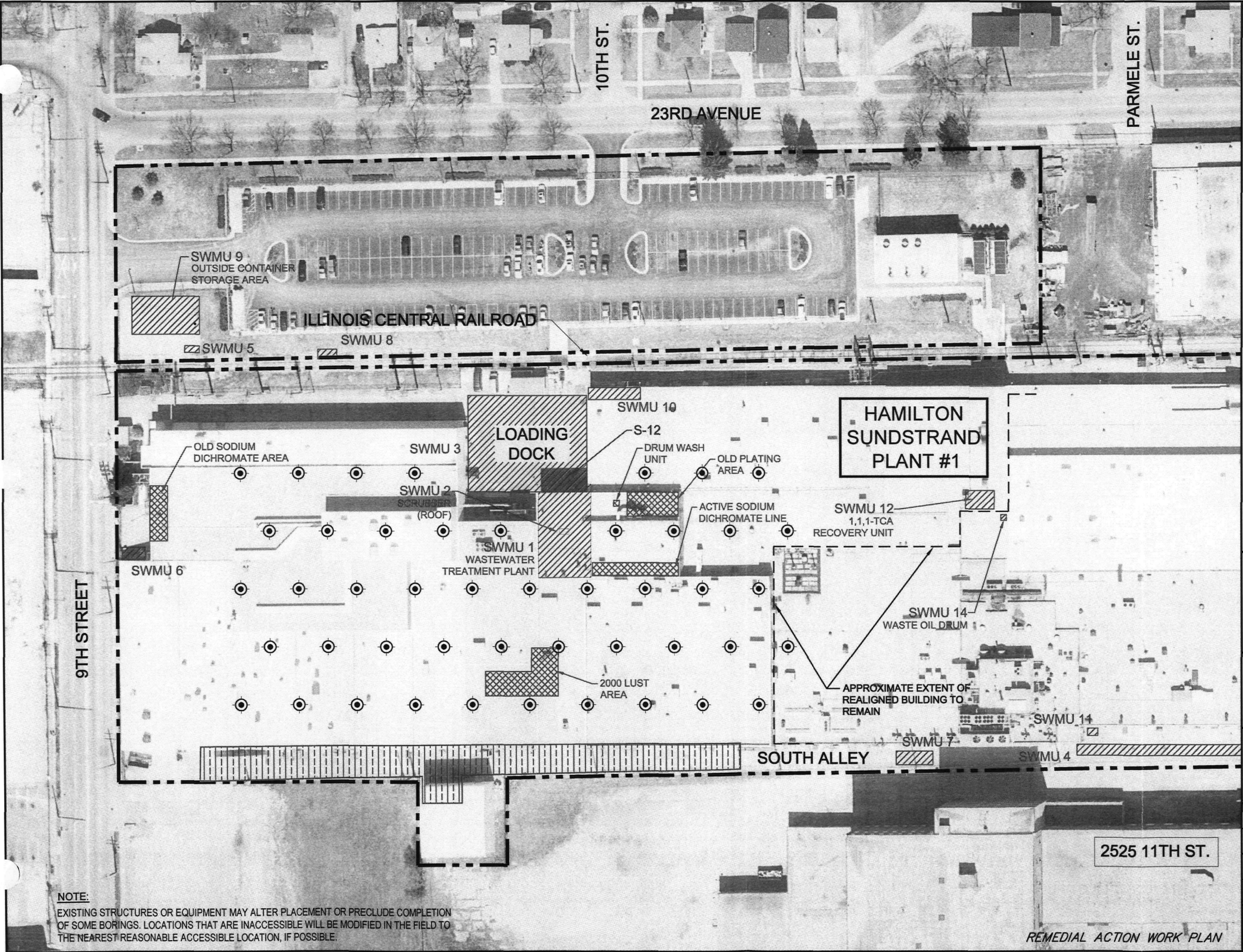
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SHEET:

1

REMEDIAL ACTION WORK PLAN



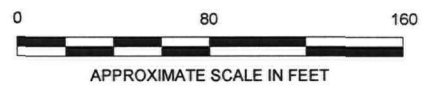
NOTE:
EXISTING STRUCTURES OR EQUIPMENT MAY ALTER PLACEMENT OR PRECLUDE COMPLETION OF SOME BORINGS. LOCATIONS THAT ARE INACCESSIBLE WILL BE MODIFIED IN THE FIELD TO THE NEAREST REASONABLE ACCESSIBLE LOCATION, IF POSSIBLE.



LEGEND:

- PROPERTY BOUNDARY
- PROPOSED BORING LOCATION
- SWMU LOCATION
- AREA OF CONCERN (AOC)
- PLANNED SVE AND AIR SPARGE REMEDIATION SYSTEM TO ADDRESS SWMU 13 (ONSITE GROUNDWATER CONTAMINATION)

NOTE:
SWMU AND AOC LOCATIONS ARE APPROXIMATE



PREPARED BY:

Stantec
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FOR:

AREA 9/10 REMEDIAL ACTION
SOUTHEAST ROCKFORD GROUNDWATER
CONTAMINATION SUPERFUND SITE
ROCKFORD, ILLINOIS

TITLE:

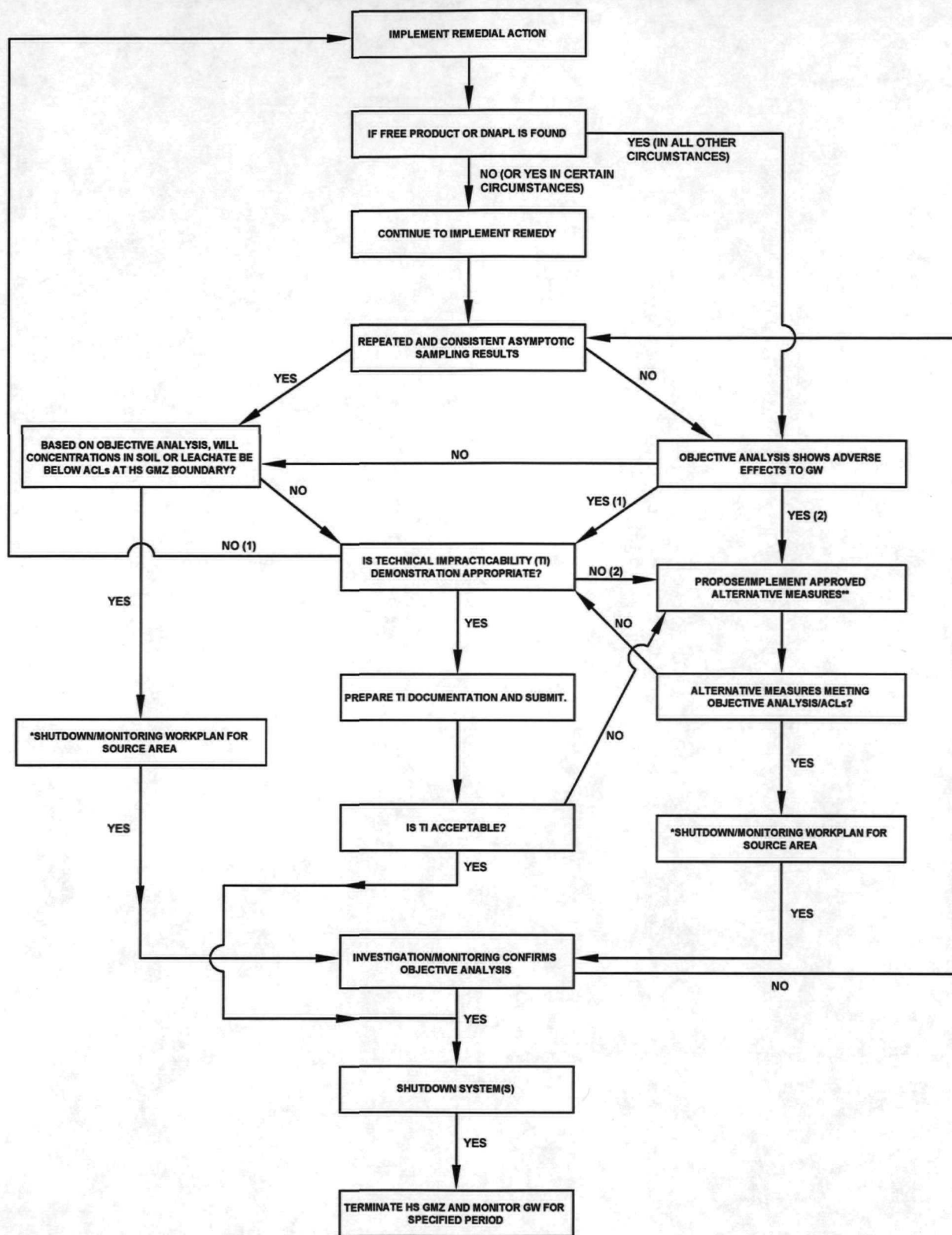
**PROPOSED UNBIASED BORING AND
GROUNDWATER GRAB LOCATIONS
PHASE I INVESTIGATION**

DRAWN BY:	JC	DESIGNED BY:	JD
CHECKED BY:	JD	APPROVED BY:	KTW
PROJECT NUMBER:	13UN.02072.08.0105	SCALE:	AS SHOWN
DATE:	9/15/08	FILE PATH:	F:\WORK\AUTOCAD\FIGURES\UTC

SHEET:

2

ANTICIPATED 0-5 YEAR TIME FRAME



*SHUTDOWN/MONITORING WORKPLAN MAY CONSIST OF IDENTIFIED SOURCE AREA(S) AND / OR PERIMETER SYSTEMS

**THESE ALTERNATIVE MEASURES MAY INCLUDE THE CONTINGENT REMEDY AS DEFINED IN THE ROD, SIMILARLY DESIGNED SYSTEMS, OR ALTERNATIVE MEASURES



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FOR:
AREA 9/10 REMEDIAL ACTION
SOUTHEAST ROCKFORD GROUNDWATER
CONTAMINATION SUPERFUND SITE
ROCKFORD, ILLINOIS

JOB NUMBER:

13UN.02072.08.0105

DRAWN BY:

JC

REMEDIAL ACTION PROCESS FLOW DIAGRAM

CHECKED BY:

JD

APPROVED BY:

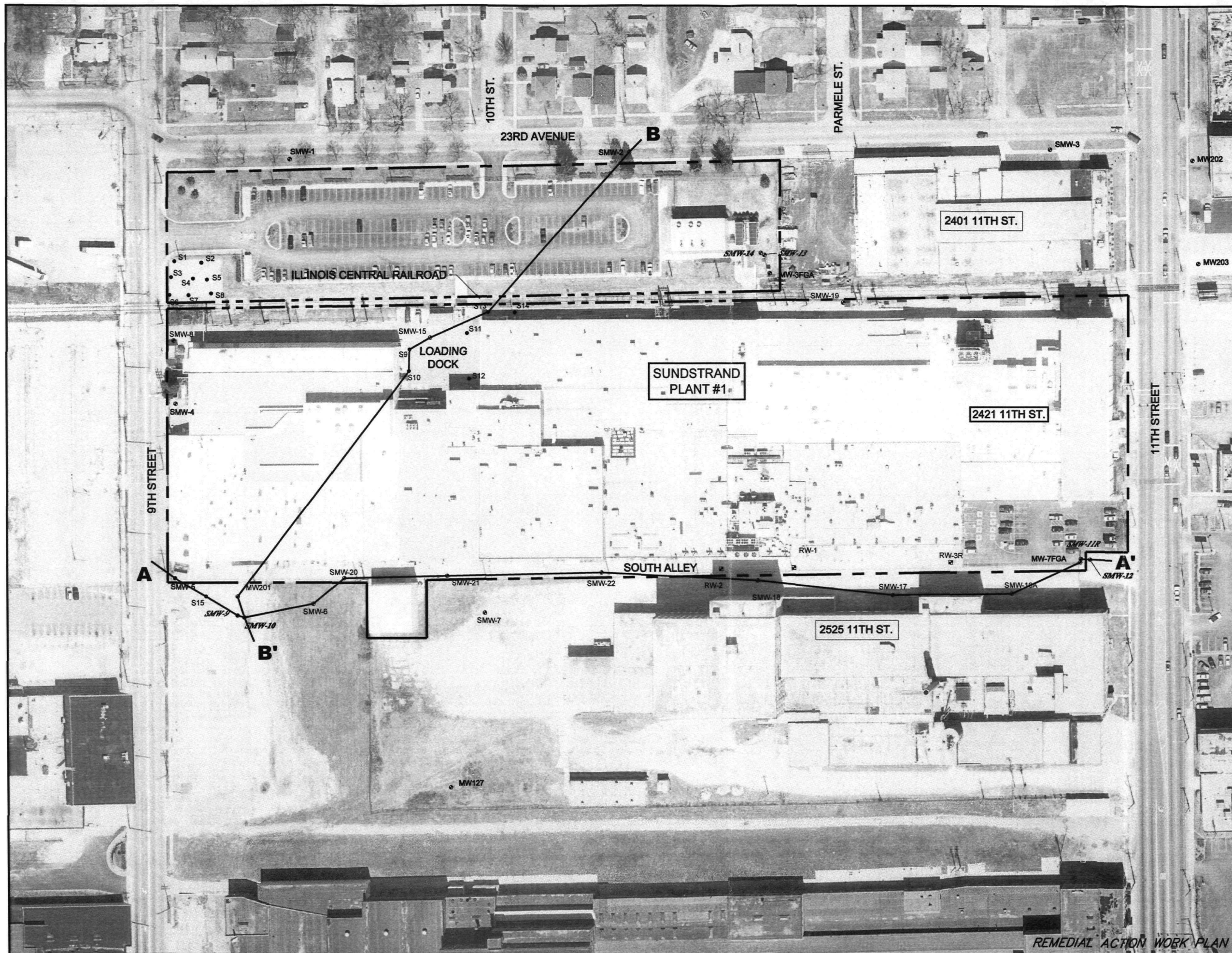
KTW

FIGURE:

3

DATE:


9/15/08



LEGEND:

- PROPERTY BOUNDARY
- MONITORING WELL
- RECOVERY WELL
- SOIL BORING
- CROSS SECTION A-A'

0 120 240
APPROXIMATE SCALE (FEET)

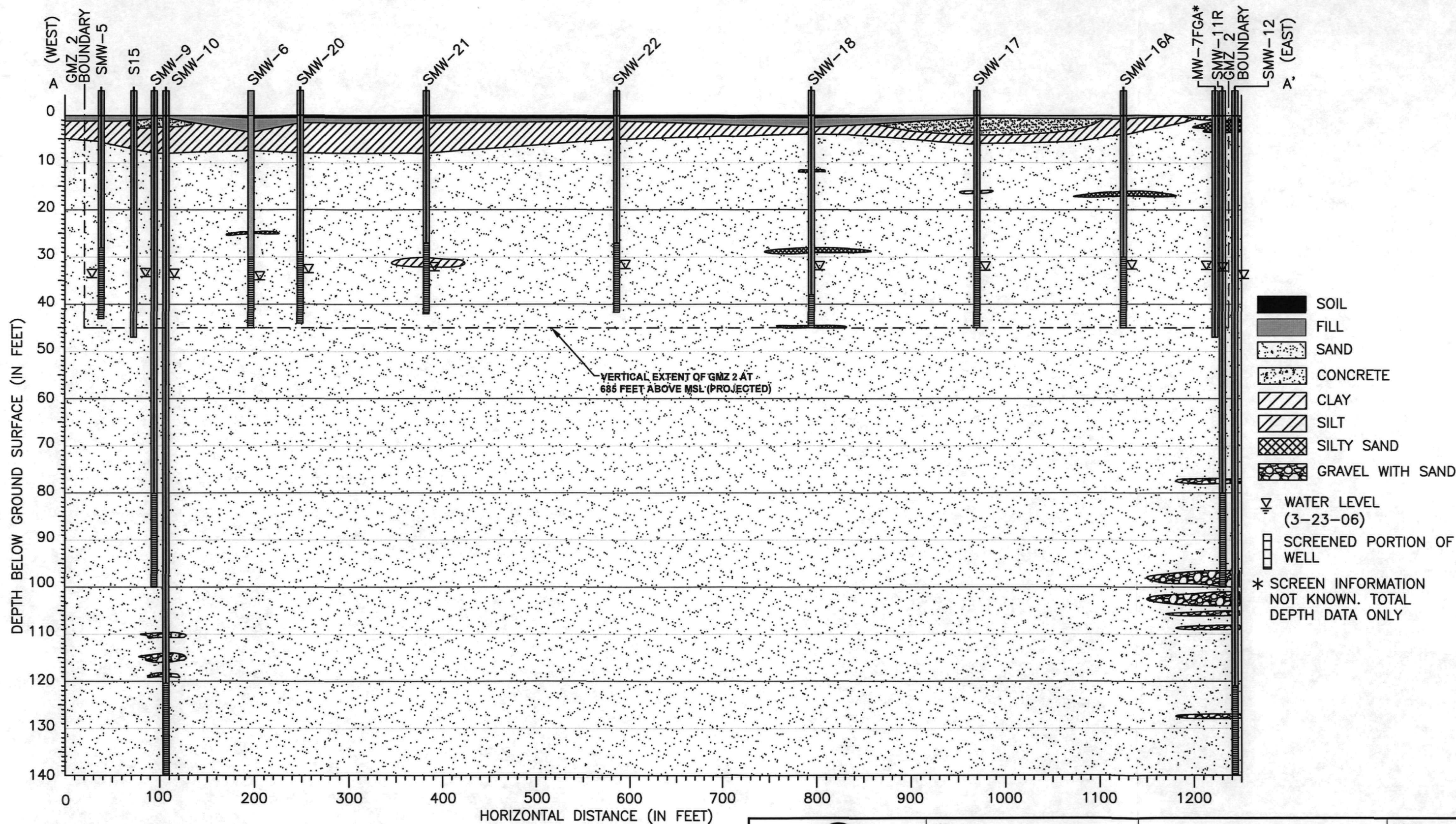
PREPARED BY: 
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LOMBARD, ILLINOIS 60148
PHONE: (630)792-1680 FAX: (630)792-1691

FOR: AREA 9/10 REMEDIAL ACTION
SOUTHEAST ROCKFORD GROUNDWATER
CONTAMINATION SUPERFUND SITE
ROCKFORD, ILLINOIS

TITLE: **AREA 9/10
CROSS-SECTION ALIGNMENTS**

DRAWN BY:	JC	DESIGNED BY:	JD
CHECKED BY:	JD	APPROVED BY:	KTW
PROJECT NUMBER:	13UN.02072.08.0105	SCALE:	AS SHOWN
DATE:	9/15/08	FILE PATH:	F:\WORK\AUTOCAD\FIGURES\UTC

SHEET: **4**



NOTE:
GROUND SURFACE ELEVATION APPROXIMATELY 729 FT ABOVE
MEAN SEA LEVEL (VARIES +/- 1.5 FEET ACROSS AREA)

REMEDIAL ACTION WORK PLAN



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FOR:
AREA 9/10 REMEDIAL ACTION
SOUTHEAST ROCKFORD GROUNDWATER
CONTAMINATION SUPERFUND SITE
ROCKFORD, ILLINOIS

JOB NUMBER:
13UN.02072.08.0105

DRAWN BY:
JC

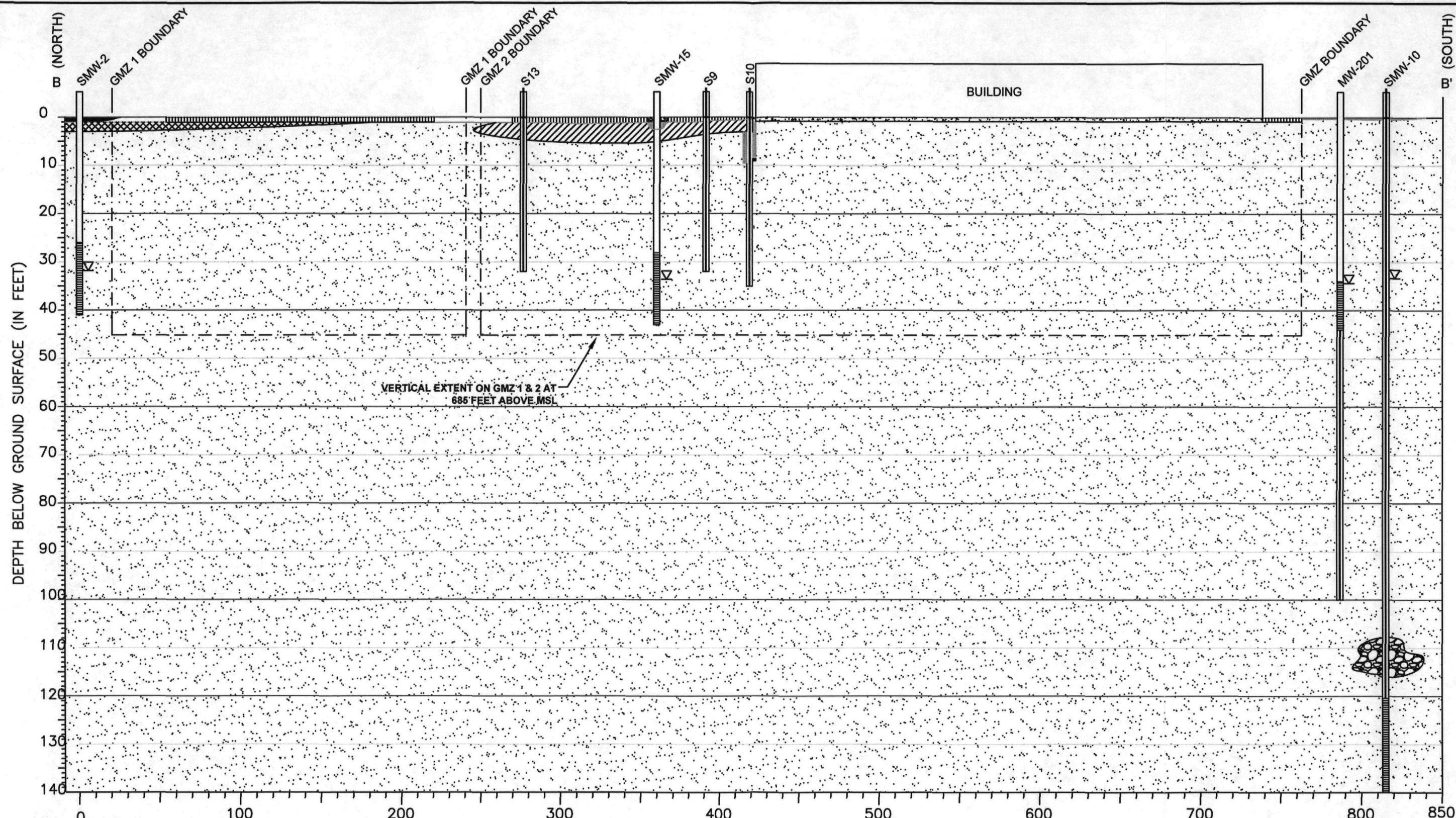
CHECKED BY:
JD

APPROVED BY:
KTV

FIGURE:

5

DATE:
9/15/08

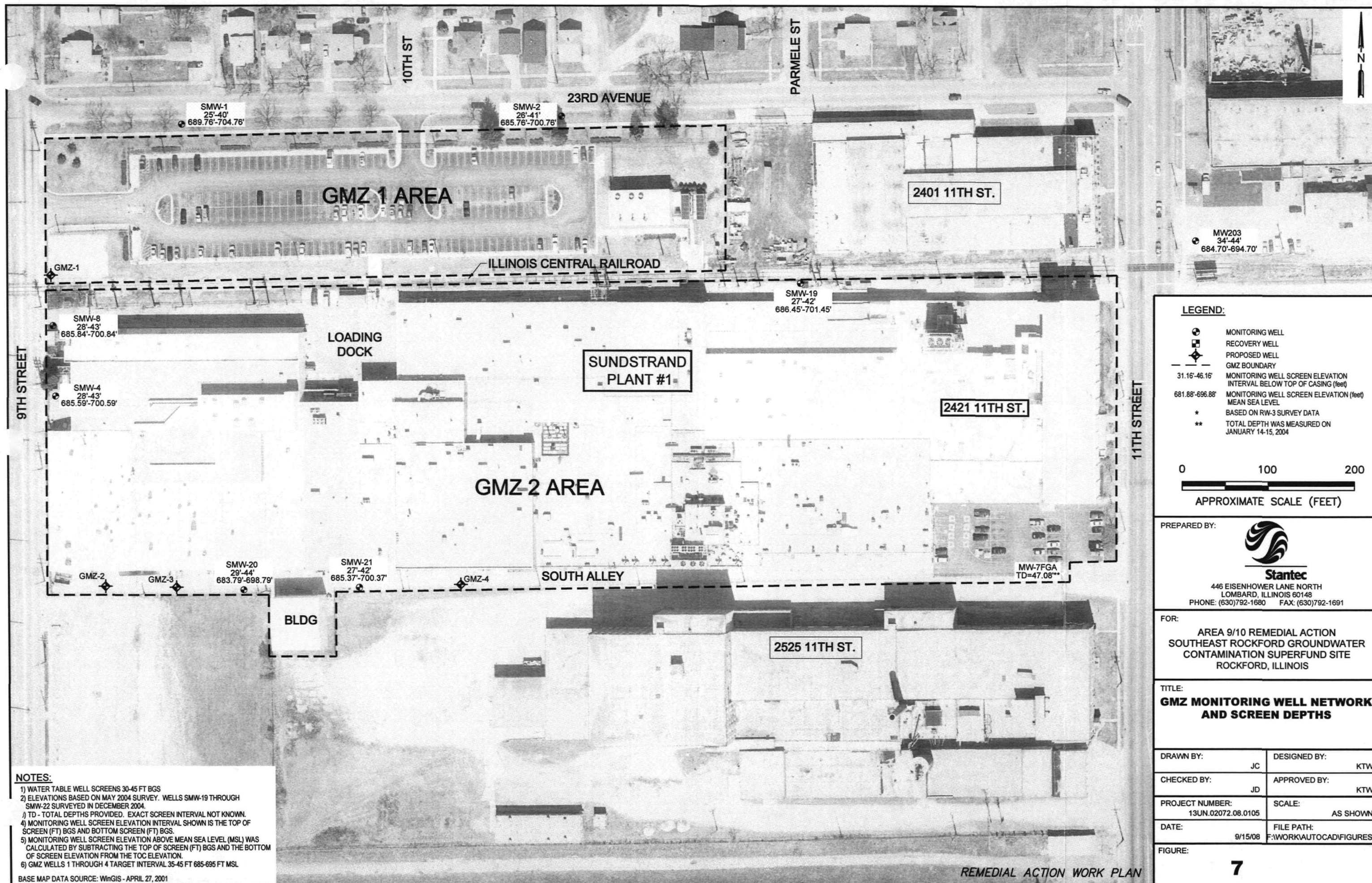


- | | | | |
|--|------------|--|--------------------------|
| | TOP SOIL | | GRAVEL WITH SAND |
| | FILL | | GRAVEL W/ SILTY CLAY |
| | SAND | | ASPHALT |
| | CLAY | | WATER LEVEL (3/23/06) |
| | CONCRETE | | SCREENED PORTION OF WELL |
| | SILTY SAND | | |

NOTE:
 GROUND SURFACE ELEVATION
 APPROXIMATELY 729 FT ABOVE MEAN SEA
 LEVEL
 (VARIES +/- 1.5 FEET ACROSS AREA)

REMEDIAL ACTION WORK PLAN

 446 EISENHOWER LANE NORTH LOMBARD, ILLINOIS 60148 PHONE: (630)792-1680 FAX: (630)792-1691	FOR: AREA 9/10 REMEDIAL ACTION SOUTHEAST ROCKFORD GROUNDWATER CONTAMINATION SUPERFUND SITE ROCKFORD, ILLINOIS		NORTH - SOUTH CROSS-SECTION B-B'		FIGURE: 6
	JOB NUMBER: 13UN.02072.08.0105	DRAWN BY: JC	CHECKED BY: JD	APPROVED BY: KTW	DATE: 9/15/08



NOTES:

- 1) WATER TABLE WELL SCREENS 30-45 FT BGS
- 2) ELEVATIONS BASED ON MAY 2004 SURVEY. WELLS SMW-19 THROUGH SMW-22 SURVEYED IN DECEMBER 2004.
- 3) TD - TOTAL DEPTHS PROVIDED. EXACT SCREEN INTERVAL NOT KNOWN.
- 4) MONITORING WELL SCREEN ELEVATION INTERVAL SHOWN IS THE TOP OF SCREEN (FT) BGS AND BOTTOM SCREEN (FT) BGS.
- 5) MONITORING WELL SCREEN ELEVATION ABOVE MEAN SEA LEVEL (MSL) WAS CALCULATED BY SUBTRACTING THE TOP OF SCREEN (FT) BGS AND THE BOTTOM OF SCREEN ELEVATION FROM THE TOC ELEVATION.
- 6) GMZ WELLS 1 THROUGH 4 TARGET INTERVAL 35-45 FT 685-695 FT MSL

BASE MAP DATA SOURCE: WinGIS - APRIL 27, 2001

LEGEND:

- MONITORING WELL
- RECOVERY WELL
- PROPOSED WELL
- GMZ BOUNDARY
- 31.16'-46.16' MONITORING WELL SCREEN ELEVATION INTERVAL BELOW TOP OF CASING (feet)
- 681.88'-696.88' MONITORING WELL SCREEN ELEVATION (feet) MEAN SEA LEVEL
- * BASED ON RW-3 SURVEY DATA
- ** TOTAL DEPTH WAS MEASURED ON JANUARY 14-15, 2004

0 100 200
APPROXIMATE SCALE (FEET)

PREPARED BY:



Stantec

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FOR:

AREA 9/10 REMEDIAL ACTION
SOUTHEAST ROCKFORD GROUNDWATER
CONTAMINATION SUPERFUND SITE
ROCKFORD, ILLINOIS

TITLE:

**GMZ MONITORING WELL NETWORK
AND SCREEN DEPTHS**

DRAWN BY:

DESIGNED BY:

JC

KTW

CHECKED BY:

JD

APPROVED BY:

KTW

PROJECT NUMBER:

13UN.02072.08.0105

SCALE:

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DATE:

9/15/08

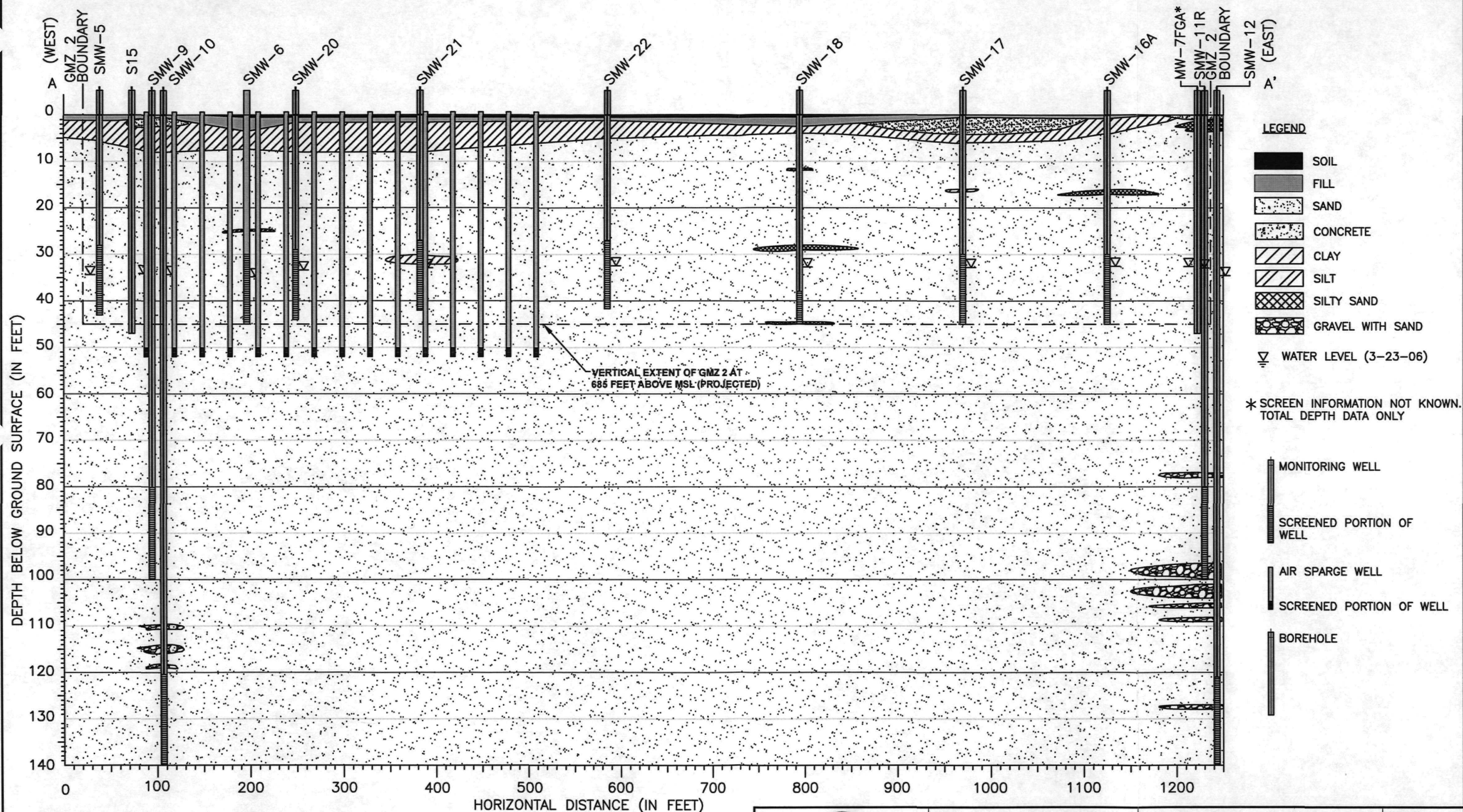
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FIGURE:

7

REMEDIAL ACTION WORK PLAN



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FOR:
AREA 9/10 REMEDIAL ACTION
SOUTHEAST ROCKFORD GROUNDWATER
CONTAMINATION SUPERFUND SITE
ROCKFORD, ILLINOIS

JOB NUMBER:
13UN.02072.08.0105

DRAWN BY:
JC

**GMZ AND AIR SPARGE WELLS
CROSS-SECTION**

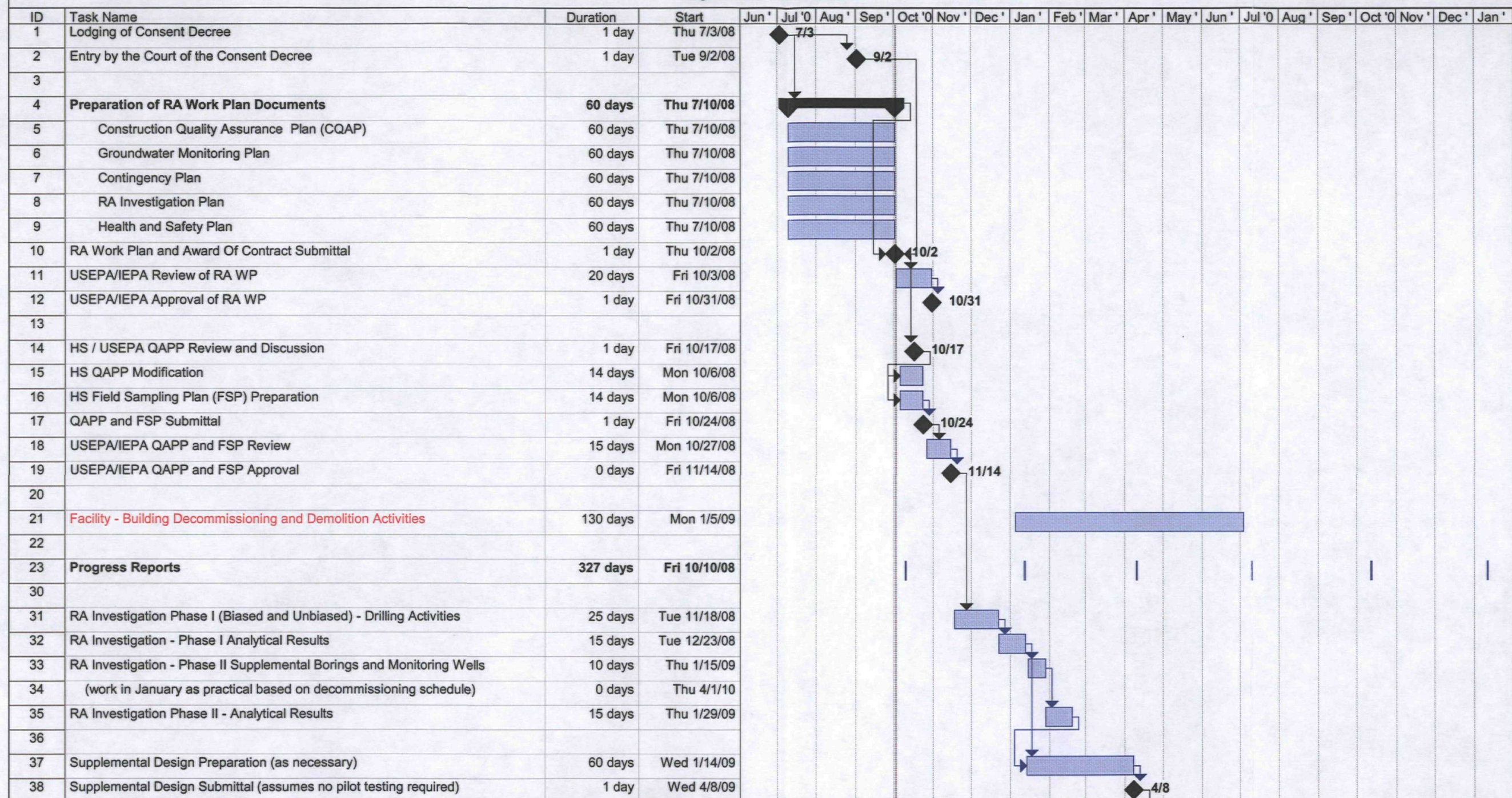
CHECKED BY:
JD

APPROVED BY:
KTV

FIGURE:
8
DATE:
9/15/08

Figure 9
Remedial Action Activities - Area 9/10
Hamilton Sundstrand Plant #1 Facility

Target Schedule 2008-2009





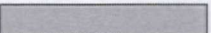




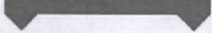

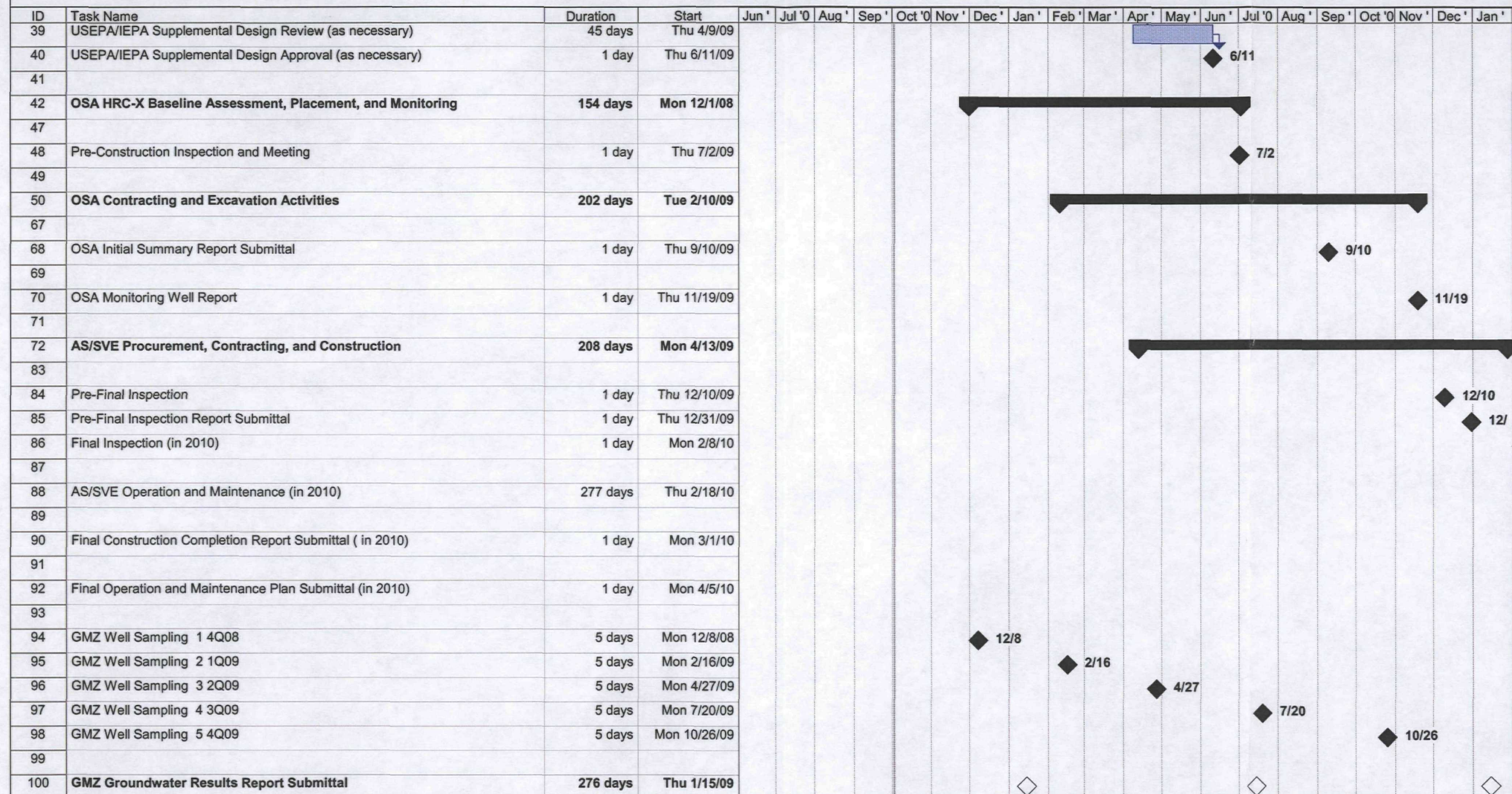
Project: HS SER 09-30-08 update ktw Date: Thu 10/2/08	Task		Milestone		External Tasks	
	Split		Summary		External Milestone	
	Progress		Project Summary		Deadline	

Figure 9
Remedial Action Activities - Area 9/10
Hamilton Sundstrand Plant #1 Facility

Target Schedule 2008-2009



Project: HS SER 09-30-08 update ktw
Date: Thu 10/2/08

Task

Split

Progress

Milestone

Summary

Project Summary

External Tasks

External Milestone

Deadline

APPENDIX A

Air Sparge System Design Calculations

Air Sparge Injection Pressure Calculation

Minimum Injection Pressure:

$$P_{\min} (\text{psgi}) = 0.43 H_h + P_{\text{packing}} + P_{\text{formation}} + P_{\text{friction loss}}$$

Where:

H_h = depth below the water table to the top of the injection well screen - the hydrostatic head

= depth of treatment zone + 5 feet (additional design factor)

= 22 ft

P_{packing} = air entry pressures for the well annulus packing material

= 0.2 psig (estimated)

$P_{\text{formation}}$ = air entry pressure for the formation

= 0.2 psig (estimated for sand)

P_{friction} = pressure loss due to friction calculated using Darcy-Weisbach equation (worksheet is attached)

= 0.524 psi

P_{\min} = $0.43 (22 \text{ ft}) + 0.2 + 0.2 + 0.524$

= 10.38 psi

Maximum Inlet Pressure:

$$P_{\text{fracture}} (\text{psig}) = 0.73 D$$

Where:

D = depth below ground surface to the top of the air injection well screened interval

= 53 ft

P_{fracture} = $0.73 (53 \text{ ft})$

= 38.69 psi

Source of Equations: A. Leeson, et al. 2002. *Air Sparging Design Paradigm*. Battelle. Columbus, Ohio. 12 August 2002.

Compressible Flow Pressure Loss Results	Piping, Valves, and Fittings	
Pressure Loss (psi): 0.524		
Job Number: 13UN.02072 Client: UTC Date: 6/19/06 Line Number: Fluid: Air Nominal Pipe Size: 1.5 Pipe Schedule: SCH 40 Flow Rate: 20 ACFM Viscosity (cP): 0.018 Inlet Pressure (PSIG): 17 Temperature (F): 80 Pipe Roughness (ft): 0.00021 Actual Pipe ID (in.): 1.61 Fluid Velocity (ft/sec): 23.59 Reynolds Number: 41513 Flow Region: Turbulent Friction Factor: 0.026 Pressure Loss (psi): 0.524 Net Expansion Factor: 0.993 Inlet Mach Number: 0.021 Outlet Mach Number: 0.021 Density at Inlet: 0.159 Specific Volume at Inlet: 6.303 K1: 1657.64 K2: 1603.14 Overall K: 54.51 Specific Heat Ratio: 1.4 M iterations: 167 Friction Factor iterations: 4	Piping Length (ft): 265 Long Radius Elbows: 2 Short Radius Elbows: 2 5 Diameter Elbows: 0 45 degree Elbows : 2 Standard 90 degree Threaded Elbows: 0 45 degree Standard Elbows : 0 Tee Flow Through: 1 Tee Flow Branch : 0 Gate: 1 Globe : 0 Swing Check: 0 Lift Check : 0	3 Way Plug : 0 Ball : 2 Plug: 0 Butterfly 2in. to 8in. : 0 Butterfly 10in. to 14in. : 0 Butterfly Greater Than 14in. : 0 Angle Valve Flow Up: 0 Angle Valve Flow Down : 0 Pipe Entrance: 1 Pipe Exit : 0 No. of Reducers: 0 Reducer Outlet Size (in) : 0 No. of Increases: 0 Increaser Outlet Size (in) : 0

PROJECT DATA

Job Number: 13UN02072 Client: UTC Date: 6/19/06

Line Number: Fluid: Air

FLUID AND PIPING

None of these fields can be left blank, enter 0 if necessary

Nominal Pipe Size: 1.5
Pipe Schedule: SCH 40
Piping Material: PVC PIPE
Flow Rate: 20 ACFM
Viscosity (cP): 0.018 Typical Values
Temperature (F): 80
Gas Molecular Weight: 29
Specific Heat Ratio: 1.4 Typical Values
Compressibility Factor: 1
Inlet Pressure (PSIG): 17
Piping Length (ft): 265

VALVES AND FITTINGS

None of these fields can be left blank, enter 0 if necessary

Flanged or Butt-Welded Elbows

2 Long Radius Elbows 2 Short Radius Elbows 0 5 Diameter Elbows 2 45 Degree Elbows

Threaded Elbows

0 90 Degree Elbows 0 45 degree Elbows

Tees

1 Tee Flow Through 0 Tee Flow Branch

Valves

☐ 1 Gate ☐ 0 Globe ☐ 0 Swing Check ☐ 0 Lift Check ☐ 0 3 Way Plug

☐ 2 Ball ☐ 0 Plug ☐ 0 Butterfly 2in. to 8in. ☐ 0 Butterfly 10in. to 14in. ☐ 0 Butterfly Greater Than 14in.

☐ 0 Angle Valve Flow Up ☐ 0 Angle Valve Flow Down

Entrance and Exits

☐ 1 Pipe Entrance ☐ 0 Pipe Exit

Reducers and Increaseers

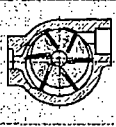
☐ 0 No. of Increaseers ☐ 0 Increaseer Outlet Size (in)

☐ 0 No. of Reducers ☐ 0 Reducer Outlet Size (in)

APPENDIX B

Air Sparge System Equipment Specifications

Data



Compressors

Compresores

Compresseurs

Compressores

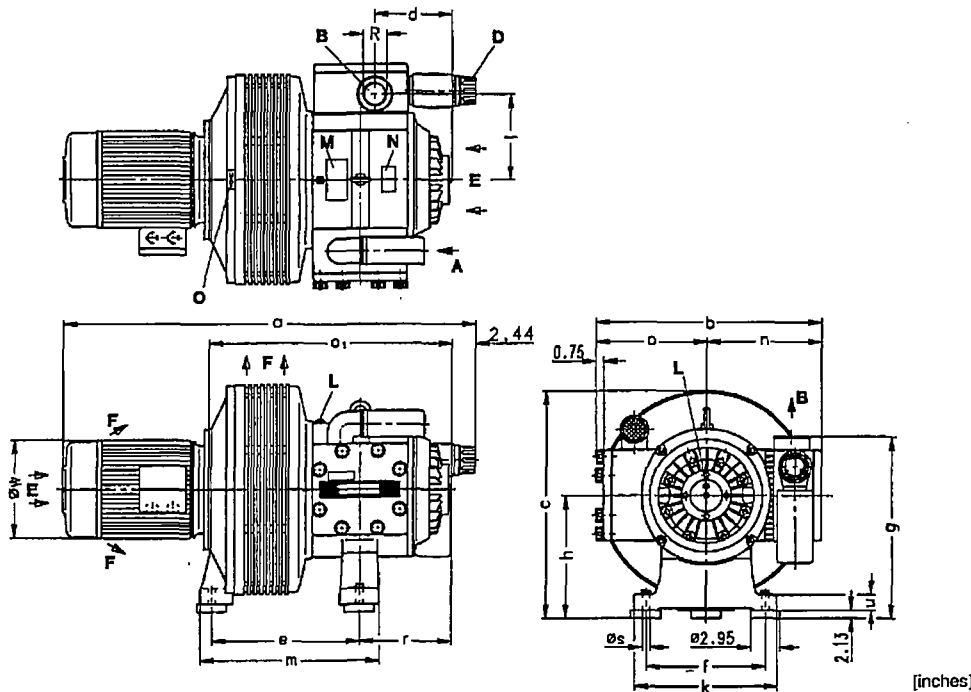
DTB (06)

MACRO

DTB 180 (06)

DTB 250 (06)

DTB 340 (06)



A	Suction	Succión	Aspiration	Sucção
B	Pressure connection	Conexión presión	Raccord surpression	Conexão da pressão
D	Pressure regulating valve	Válvula reguladora de presión	Valve de réglage pression	Válvula de regulação da pressão
E	Cooling air entry	Entrada aire refrigerante	Entrée air refroidissement	Entrada do ar refrigerante
F	Cooling air exit	Salida aire refrigerante	Sortie air refroidissement	Saída do ar refrigerante
L	Greasing points	Puntos de engrase	Points de graissage	Pontos de lubrificação
M	Greasing label	Rótulo engrase	Etiquette graissage	Rótulo da lubrificação
N	Data plate	Placa fecha	Etiquette caractéristique	Placa da data
O	Rotation arrow	Dirección de rotación	Flèche sens rotation	Direção da rotação

DTB (06)		180			250			340			
kw		50 Hz	5.5	7.5	11	7.5	11	15	15	18.5	22
hp		60 Hz	-	15	20	15	20	25	25	30	40
[inches]	a	50 Hz	45.35	50.94		50.94		52.56	54.41	56.38	
		60 Hz	-	54.20		54.20		56.74	57.21		59.94
	a ₁	50 Hz	26.97	28.15		28.15		29.21		29.21	
		60 Hz	-	28.38		28.38		29.02	29.49		30.28
	b		22.36		22.36		27.72		27.72		
	c		26.73		26.73		32.44		32.44		
	d		7.80		7.80		7.80		7.80		
	e	50 Hz		16.10		16.10		16.97		16.97	
		60 Hz	-	16.10		16.10		16.97		16.97	
	f		11.81		11.81		19.69		19.69		
	g		20.79		20.79		25.43		25.43		
	h		16.30		16.30		19.45		19.45		
	k		14.17		14.17		22.05		22.05		
	l		8.50		8.50		10.55		10.55		
	m		19.25		19.25		20.83		20.83		
	n / o		11.50 / 10.87		11.50 / 10.87		14.21 / 13.50		14.21 / 13.50		
	r		10.55		10.55		10.55		10.55		
	ø s		0.71		0.71		0.79		0.79		
	u		1.57		1.57		1.97		1.97		
	ø w	50 Hz	9.69	12.28		12.28		14.17	14.17		
		60 Hz	-	14.60		14.60		16.65	16.65		19.25
R			2" NPT			2" NPT			3" NPT		

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2/5/2002

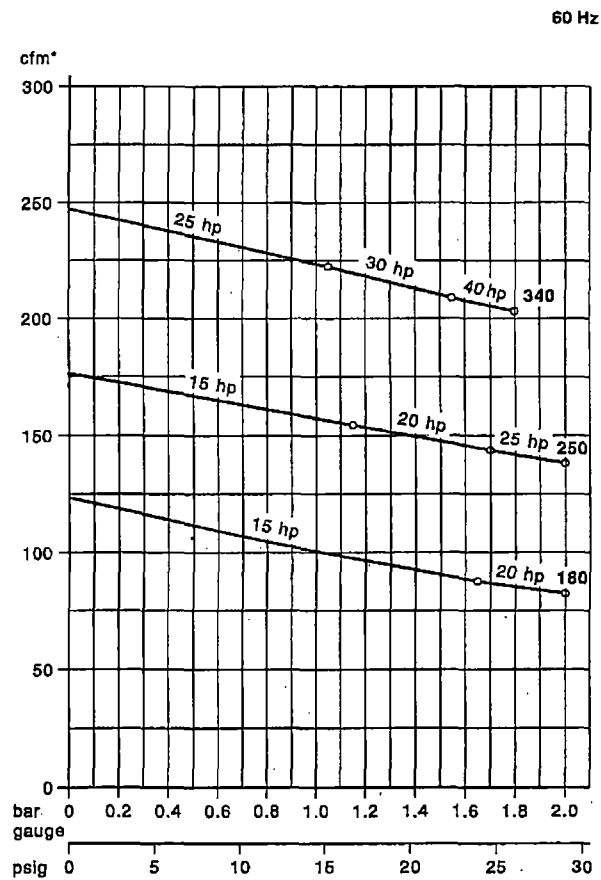
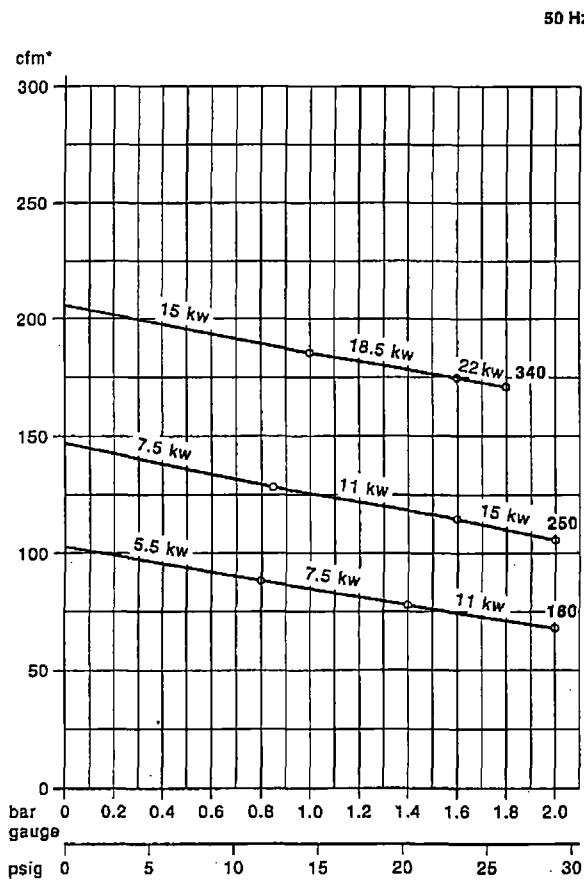
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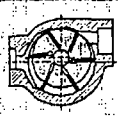
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DTB (06)		180			250			340		
cfm	50 Hz	103			147			208		
	60 Hz	123			177			247		
psig	50 Hz	11.6	20.3	29.0	12.3	23.2	29.0	14.5	23.2	26.1
	60 Hz	-	23.9	29.0	16.7	24.7	29.0	15.2	22.5	26.1
3~	50 Hz	400/690V ± 10%								
	60 Hz	230/460V ± 10%								
kw	50 Hz	5.5	7.5	11	7.5	11	15	15	18.5	22
hp	60 Hz	-	15	20	15	20	25	25	30	40
A	50 Hz	14.5/8.4	17.5/10	24.0/14	17.5/10	24.0/14	30/17.5	30/17.5	43/24.8	42.5/24.5
	60 Hz	-	41/20.5	54/27	41/20.5	54/27	69/34.5	69/34.5	74/37	102/51
rpm	50 Hz	950								
	60 Hz	1140								
dB(A)	50 Hz	74		75	74		75	77		78
	60 Hz	77		78	77		78	82		83
lbs	50 Hz	518	584	617	573	606	673	948	1036	1235
	60 Hz	-	763	785	742	774	921	1197	1240	1396
ZRK	50 (03)			50 (03)			80 (03)			
ZAF	65 (50)			65 (50)			80 (50)			
ZMS / ZAD / ZBX	#	#	#	#	#	#	#	#	#	
cfm	Capacity	Capacidad			Volume engendré			Capacidade		
pslg	Excess pressure	Exceso de presión			Surpression			Pressão excessiva		
3~	Motor version	Versión motor			Exécution moteur			Versão do motor		
kw / hp	Motor rating	Datos motor			Puissance moteur			Potência do motor		
A	Full load amperage	Amperaje de plena carga			Intensité absorbée			Amperagem da carga total		
rpm	Speed	Velocidad			Vitesse rotation			Velocidade		
dB(A)	Average noise level	Nivel de ruido medio			Niveau sonore moyen			Nível médio de ruído		
lbs	Weight	Peso			Poids			Peso		
	Accessories	Accesorios			Accessoires			Acessórios		
ZRK	Non return valve	Válvula retención			Clapet anti-retour			Válvula sem retorno		
ZAF	Suction filter	Filtro succión			Filtre d'aspiration			Filtro de sucção		
ZMS	Motor starter	Arranque motor			Disjoncteur moteur			Arranque do motor		
ZAD	Soft starter	Soft starter			Démarriage progressif			Soft starter		
ZBX	Sound box	Caja de sonido			Caisson insonorisant			Canópia		



* Capacity refers to free air at 1 standard atmosphere and 20° C (68° F). / La capacidad se refiere al aire libre a 1 atmosfera estándar de presión y a 20° C (68° F) de temperatura. / Le débit est mesuré à l'atmosphère de 1 bar (abs.) à 20° C (68° F). / A capacidade refere-se ao ar livre a uma atmosfera padrão 1 e a 20° C (68° F).
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Compressors

Compresores

Compresseurs

Compressores

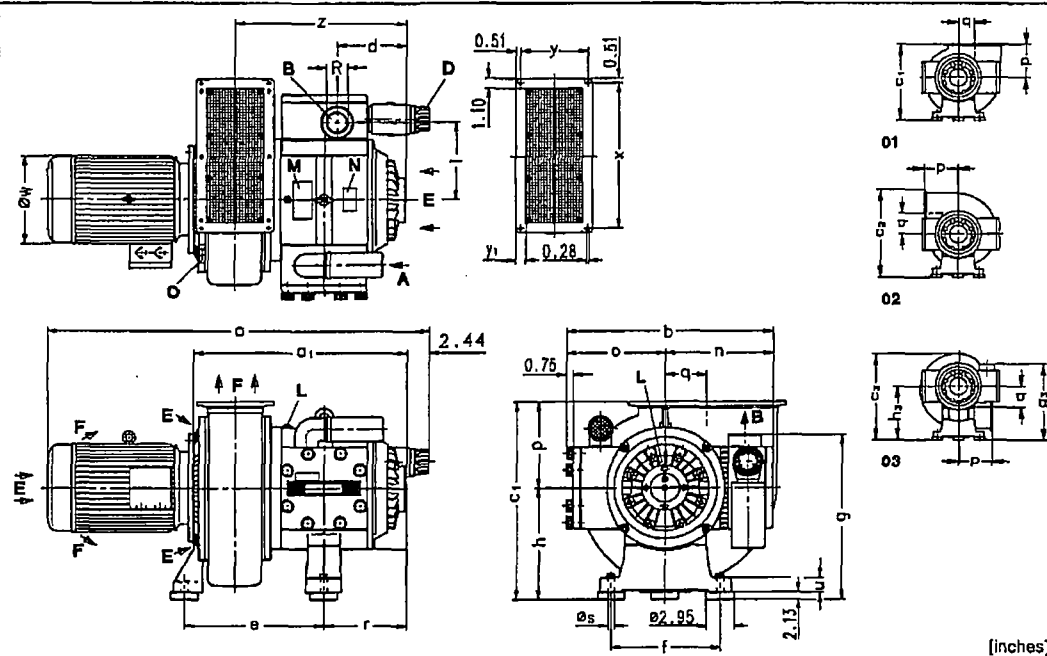
DTB (36)

MACRO

DTB 180 (36)

DTB 250 (36)

DTB 340 (36)



[inches]

01-03	Connection positions	Posiciones conexión	Positions raccordement	Posições de conexão
01	Standard version	Versión estándar	Exécution standard	Versão padronizada
A	Suction	Succión	Aspiration	Sucção
B	Pressure connection	Conexión presión	Raccord surpression	Conexão da pressão
D	Pressure regulating valve	Válvula reguladora de presión	Valve de réglage pression	Válvula de regulação da pressão
E	Cooling air entry	Entrada aire refrigerante	Entrée air refroidissement	Entrada do ar refrigerante
F	Cooling air exit	Salida aire refrigerante	Sortie air refroidissement	Saída do ar refrigerante
L	Greasing points	Puntos de engrase	Points de graissage	Pontos de lubrificação
M	Greasing label	Rótulo engrase	Etiquette graissage	Rótulo da lubrificação
N	Data plate	Placa fecha	Etiquette caractéristique	Placa da data
O	Rotation arrow	Dirección de rotación	Flèche sens rotation	Direção da rotação

DTB (36)		180			250			340			
kw		50 Hz	5.5	7.5	11	7.5	11	15	15	18.5	22
hp		60 Hz	-	15	20	15	20	25	25	30	40
[inches]	a	50 Hz	44.69	50.75		50.75		53.15	53.90	65.87	
		60 Hz	-	53.25		53.25		55.79	56.95	69.54	
	a ₁	50 Hz	26.30	27.95		27.95				28.70	
		60 Hz	-	27.43		27.43		28.07	29.23		29.88
	b		22.36		22.36				27.72		
	c ₁		25.75		25.75				31.26		
	c ₂		29.57		29.57				35.87		
	c ₃ / d		25.63 / 7.80		25.63 / 7.80				31.34 / 7.80		
	e	50 Hz		18.61		18.61				17.87	
		60 Hz	-	16.61		16.61				17.87	
	f		11.81		11.81				19.69		
	g		20.79		20.79				25.43		
	h		16.30		16.30				19.45		
	q ₁ / h ₂		20.83 / 16.30		20.83 / 16.30				25.47 / 19.45		
	l		8.50		8.50				10.55		
	n / o		11.50 / 10.87		11.50 / 10.87				14.21 / 13.50		
	p / q		9.45 / 4.80		9.45 / 4.80				11.81 / 6.18		
	r		10.55		10.55				10.55		
	as / u		0.79 / 1.57		0.79 / 1.57				0.79 / 1.97		
	aw	50 Hz	9.69	12.28		12.28		14.17	14.17		
		60 Hz	-	14.60		14.60		16.65	16.65	19.25	
x		15.91		15.91				19.45			
y / y ₁		7.24 / 1.10		7.24 / 1.10				8.62 / 1.22			
z		21.81		21.81				22.48			
R		2" NPT		2" NPT				3" NPT			

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2.5.2002

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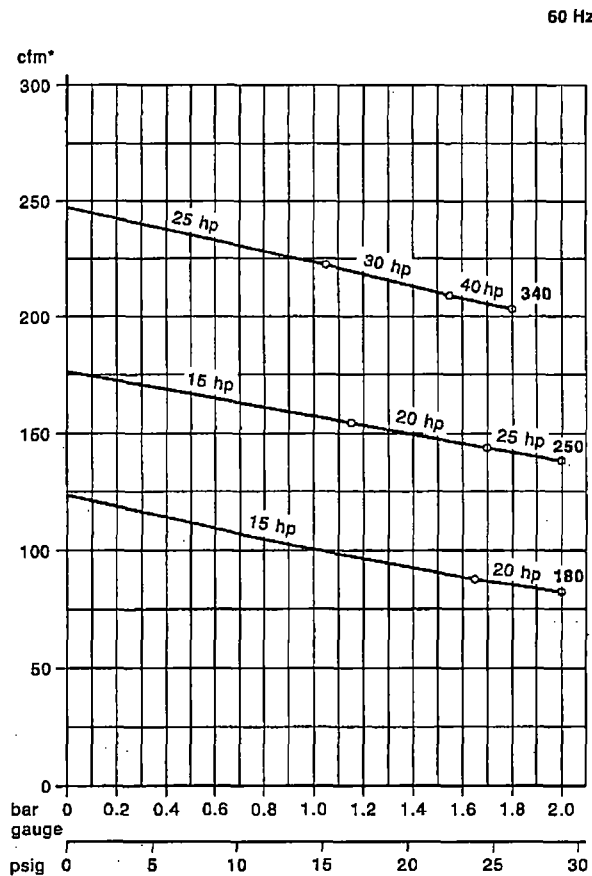
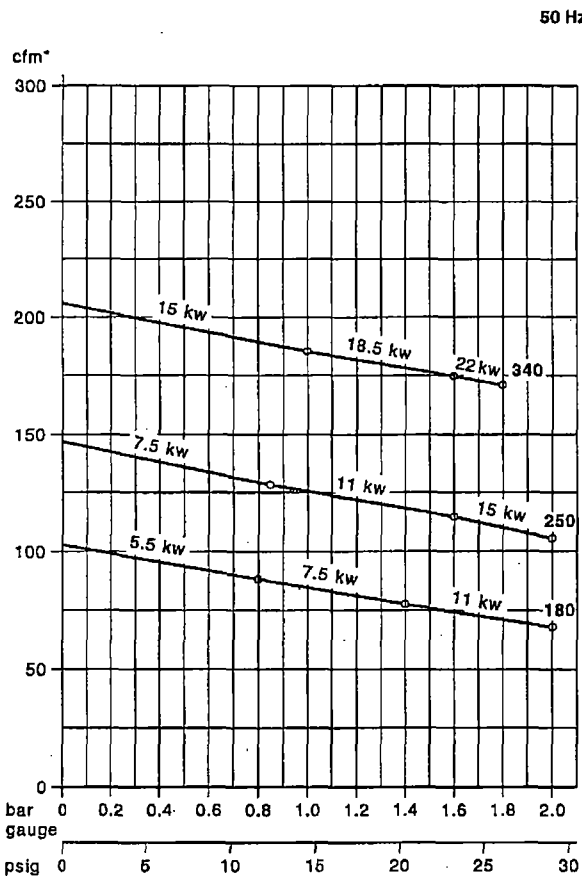
E-Mail:

sales@vacuumpumps.com

http://

www.vacuumpumps.com

DTB (36)		180			250			340		
cfm	50 Hz	103			147			206		
	60 Hz	123			177			247		
psig	50 Hz	11.6	20.3	29.0	12.3	23.2	29.0	14.5	23.2	26.1
	60 Hz	-	23.9	29.0	16.7	24.7	29.0	15.2	22.5	26.1
3~	50 Hz	400/690V \pm 10%								
	60 Hz	230/460V \pm 10%								
kw	50 Hz	5.5	7.5	11	7.5	11	15	15	18.5	22
hp	60 Hz	-	15	20	15	20	25	25	30	40
A	50 Hz	14.5/8.4	17.5/10	24.0/14	17.5/10	24.0/14	30/17.5	30/17.5	43/24.8	42.5/24.5
	60 Hz	-	41/20.5	54/27	41/20.5	54/27	69/34.5	69/34.5	74/37	102/51
rpm	50 Hz	950								
	60 Hz	1140								
dB(A)	50 Hz	74		75	74		75	77		78
	60 Hz	77		78	77		78	82		83
lbs	50 Hz	529	595	628	584	617	684	970	1058	1257
	60 Hz	-	764	796	753	785	932	1219	1262	1418
ZRK		50 (03)			50 (03)			80 (03)		
ZAF		65 (50)			65 (50)			80 (50)		
ZMS / ZAD / ZBX		#	#	#	#	#	#	#	#	#
cfm	Capacity	Capacidad			Volume engendré			Capacidade		
psig	Excess pressure	Exceso de presión			Surpression			Pressão excessiva		
3~	Motor version	Versión motor			Exécution moteur			Versão do motor		
kw / hp	Motor rating	Datos motor			Puissance moteur			Potência do motor		
A	Full load amperage	Amperaje de plena carga			Intensité absorbée			Amperagem da carga total		
rpm	Speed	Velocidad			Vitesse rotation			Velocidade		
dB(A)	Average noise level	Nível de ruido medio			Niveau sonore moyen			Nível médio de ruído		
lbs	Weight	Peso			Poids			Peso		
ZRK	Accessories	Accesorios			Accessoires			Acessórios		
ZAF	Non return valve	Válvula retención			Clapet anti-retour			Válvula sem retorno		
ZMS	Suction filter	Filtro succión			Filtre d'aspiration			Filtro de sucção		
ZAD	Motor starter	Arranque motor			Disjoncteur moteur			Arranque do motor		
ZBX	Soft starter	Soft starter			Démarrage progressif			Soft starter		
	Sound box	Caja de sonido			Caisson insonorisant			Canópla		



* Capacity refers to free air at 1 standard atmosphere and 20° C (68° F). / La capacidad se refiere al aire libre a 1 atmosfera estándar de presión y a 20° C (68° F) de temperatura. / Le débit est mesuré à l'atmosphère de 1 bar (abs.) à 20° C (68° F). / A capacidade refere-se ao ar livre a uma atmosfera padrão 1 e a 20° C (68° F).

Curves and tables refer to compressor at normal operating temperature. / Las curvas y las tablas se refieren al compresor a la temperatura normal de operación. / Les courbes et tableaux sont établis, compresseur à température de fonctionnement. / As curvas e tabelas referem-se ao compressor a temperatura normal de operação.

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on request # on pedido # sur demande # a pedido

The listed values for a, w and full load amperage may vary because of different motor manufacturers. / Los valores listados para a, w y para el amperaje de carga completa pueden variar para distintos fabricantes de motores. / Les dimensions a et w ainsi que l'ampérage peuvent différer des données indiquées, ci-dessus, selon le fabricant du moteur. / Como variam os fabricantes de motores, poderá haver variação dos valores indicados para a, w e para uma amperagem de carga total.

APPENDIX C

Soil Vapor Extraction System Design Calculations

Soil Vapor Extraction System Design Calculations

Radius of Influence from pilot test results ≈ 50 ft @ 20" H₂O and 72 acfm

Target treatment zone 8 ft in length

Pore Volume Exchange Time:

$$E = (\epsilon V) / Q$$

Where:

ϵ = soil porosity = 0.35 for sand

V = volume of soil to be treated

$$= \pi (R^2) \cdot D = \pi (50 \text{ ft})^2 \cdot 8 \text{ ft} = 6.28 \times 10^4 \text{ ft}^3$$

$$E = [(0.35) (6.28 \times 10^4 \text{ ft}^3)] / 72 \text{ acfm} = 305 \text{ min} = 5.08 \text{ hrs} = 5 \text{ hrs}$$

Estimated Number of SVE Extraction Wells Required per Treatment Cell

$$N = (\text{Treatment Area}) / \pi \cdot (Roi)^2$$

Where:

Treatment Area = Length of treatment area \cdot Diameter of air sparge radius of influence

Roi = Radius of Influence from pilot test results ≈ 50 ft @ 20" H₂O and 72 acfm

$$\begin{aligned} N &= (30 \text{ ft} \cdot 150 \text{ ft}) / \pi (50 \text{ ft})^2 \\ &= 0.57 \approx 1 \end{aligned}$$

Note: The above calculation does not account for the geometry of the treatment area. In the above equation, the influence area of the vertical SVE well is assumed to be circular. The design treatment area is a rectangle which is three times longer than it is wide. Due to the elongated shape of the treatment area, an additional extraction well per treatment cell will be necessary to completely capture air sparge generated soil vapors. The treatment system design specifies two vapor extraction wells per treatment cell. The extraction well layout is shown in Figure Y5.

Source of Equations: USEPA, *How to Evaluate Cleanup Technologies for Underground Storage Tank Sites: A Guide for Corrective Action Plan Reviewers*, EPA 510-B-94-003, October 1994.

Compressible Flow Pressure Loss Results		Piping, Valves, and Fittings	
Pressure Loss (psi): 1.19			
Job Number: 13UN.02072 Client: UTC - Hamilton Sundstrand Date: 6/21/06 Line Number: Fluid: Nominal Pipe Size: 2 Pipe Schedule: SCH 40 Flow Rate: 100 ACFM Viscosity (cP): 0.018 Inlet Pressure (PSIG): 0 Temperature (F): 70 Pipe Roughness (ft): 0.000005 Actual Pipe ID (in.): 2.067 Fluid Velocity (ft/sec): 71.56 Reynolds Number: 76387 Flow Region: Turbulent Friction Factor: 0.0192 Pressure Loss (psi): 1.19 Net Expansion Factor: 0.975 Inlet Mach Number: 0.063 Outlet Mach Number: 0.069 Density at Inlet: 0.075 Specific Volume at Inlet: 13.34 K1: 172.29 K2: 144.85 Overall K: 27.43 Specific Heat Ratio: 1.4 Iterations: 162 Friction Factor Iterations: 4		Piping Length (ft): 225 Long Radius Elbows: 2 Short Radius Elbows: 2 5 Diameter Elbows: 0 45 degree Elbows: 0 Standard 90 degree Threaded Elbows: 0 45 degree Standard Elbows: 0 Tee Flow Through: 1 Tee Flow Branch: 0 Gate: 1 Globe: 0 Swing Check: 0 Lift Check: 0 3 Way Plug: 0 Ball: 1 Plug: 0 Butterfly 2in. to 8in.: 0 Butterfly 10in. to 14in.: 0 Butterfly Greater Than 14in.: 0 Angle Valve Flow Up: 0 Angle Valve Flow Down: 0 Pipe Entrance: 1 Pipe Exit: 0 No. of Reducers: 0 Reducer Outlet Size (in): 0 No. of Increasers: 0 Increaser Outlet Size (in): 0	

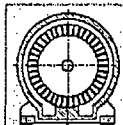
APPENDIX D

Soil Vapor Extraction System Equipment Specifications

Data

Rietschle Thomas

A Thomas Industries Company

Side channel
vacuum pumpsBombas de vacío
de canal lateralTurbine latérale
videBombas de vácuo
de canal lateral

SAP

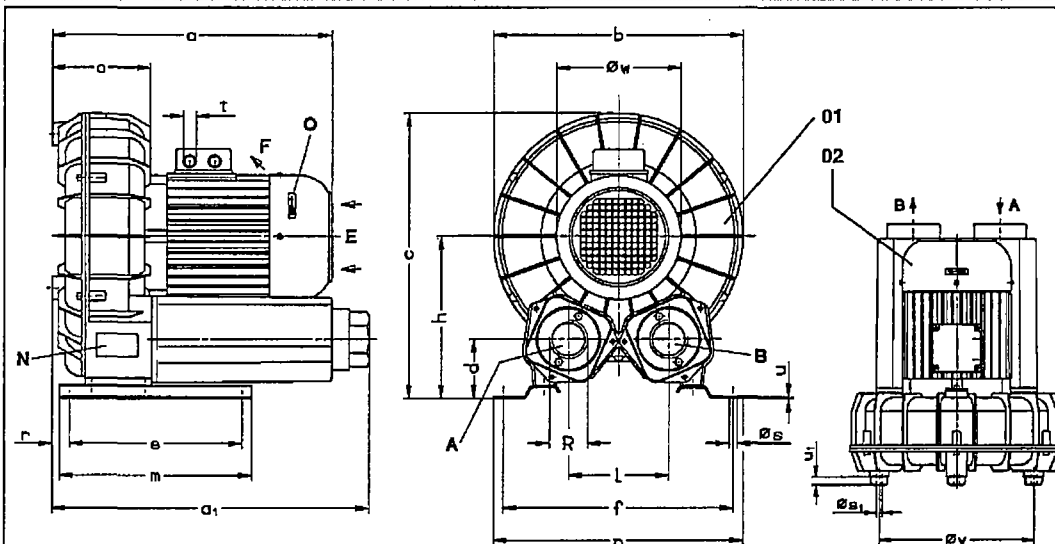
BORA

SAP 220

SAP 300

SAP 380

SAP 450



01	Standard version	Versión estándar	Exécution standard	Versão padronizada
02	Vertical version	Versión vertical	Exécution vertical	Versão vertical
A	Vacuum connection	Conexión vacío	Raccord du vide	Conexão do vácuo
B	Exhaust	Escape	Refolement	Exaustão
E	Cooling air entry	Entrada aire refrigerante	Entrée air refroidissement	Entrada do ar refrigerante
F	Cooling air exit	Salida aire refrigerante	Sortie air refroidissement	Saída do ar refrigerante
N	Data plate	Placa fecha	Etiquette caractéristique	Placa da data
O	Rotation arrow	Dirección de rotación	Flèche sens rotation	Direção da rotação

SAP	220	300	380	450
[Inches]				
a	15.12	16.50	16.93	16.81
a ₁	17.64	17.24	17.36	17.76
b	14.57	15.20	17.01	17.24
c	16.30	17.44	20.51	23.94
d	3.19	3.62	3.82	23.64
e / f	10.63 / 10.83	10.63 / 14.02	10.63 / 14.17	17.72
h	9.02	9.84	10.63	20.67
m / n	11.81 / 12.01	11.81 / 15.20	11.81 / 15.35	4.61
l	5.51	6.10	6.10	18.50 / 16.14
o	5.91	6.18	7.09	11.81
r	1.65	1.18	1.85	7.13
os / os ₁	0.43 / M6	0.43 / M8	0.43 / M8	7.09
t	M 20 x 1.5	M 20 x 1.5	M 20 x 1.5	1.73
u	0.12	0.12	0.12	0.43 / M 10
u ₁	0.79	0.59	0.59	M 20 x 1.5
v	11.02	12.60	12.60	M 32 x 1.5
vw	8.97	6.97	7.68	0.16
R	2" NPT	2" NPT	2" NPT	1.18

ZRK	50 (05)	50 (05)	50 (05)	80 (05)
ZUV/ZBS	50 Hz ZBS 65	ZUV 32	ZBS 65 ZBS 65 ZBS 40	ZBS 65 ZBS 80 ZBS 80
	60 Hz ZBS 65	ZUV 32	ZBS 80 ZBS 80 ZBS 65	ZBS 65 ZBS 80 ZBS 80
ZVF	50 Hz / 60 Hz	50 (71)	65 (70)	65 (70) / 100 (74)
ZGD		50 (06)	50 (06)	50 (06)
ZFP		216 (01)	216 (51)	216 (52)
ZMS		#	#	#
ZWS		83 (11)	83 (12)	83 (12)

ZRK	Accessories	Accesorios	Accessoires	Acessórios
ZUV/ZBS	Non return valve	Válvula retención	Clapet anti-retour	Válvula sem retorno
ZVF	Vacuum limitation valve	Válvula limitación vacío	Limiteur de dépression	Válvula de limitação do vácuo
ZGD	Vacuum tight suction filter	Filtro succión hermético	Filtre d'aspiration étanche	Filtro de sucção à prova de vácuo
ZFP	Additional silencer	Silenciador adicional	Silencieux complémentaire	Silenciador adicional
ZMS	Dust separator	Separador de polvo	Filtre séparateur étanche	Separador de poeira
ZWS	Motor starter	Arranque motor	Disjoncteur moteur	Arranque do motor
	Change over valve	Válvula conmutadora	Inverseur de débit	Permuta de válvula

Models SAP / 5.5 kw and larger have an additional cooling fan situated between the motor and blower housing.
Los modelos SAP / 5.5 kw y superiores cuentan con un ventilador de refrigeración adicional situado entre el motor y la caja de la soplante.
A partir de la SAP / 5.5 kw, un ventilateur complémentaire est inséré entre le moteur et le corps de la turbine.
Os modelos a partir do SAP / 5.5 kw têm uma ventoinha de refrigeração adicional colocada entre o motor e o corpo do ventilador.

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4.1.2002

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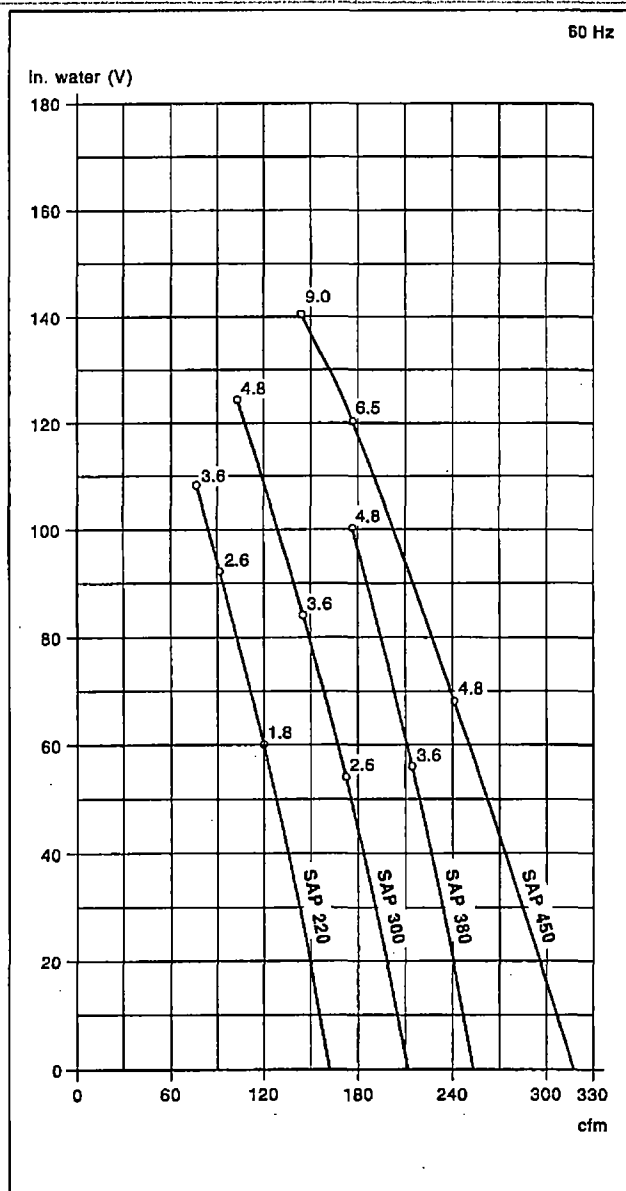
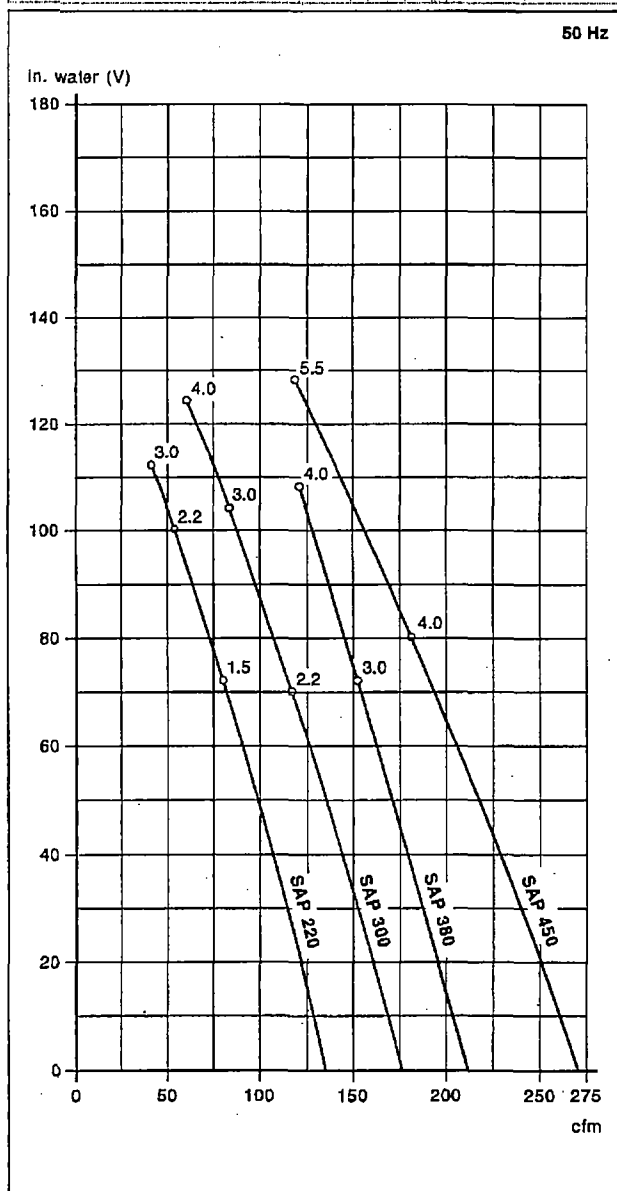
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SAP		220			300			380			450		
cfm	50 Hz	135			177			212			271		
	60 Hz	162			212			253			318		
in. water (V)	50 Hz	72.3	100	112	70.3	104	124	72.3	108	-	80.3	128	-
	60 Hz	60.2	92.3	108	54.2	84.3	124	56.2	100	-	68.3	120	141
3-	50 Hz	200-255/346-440 V \pm 5%											
	60 Hz	200-277/346-480 V \pm 5%											
kw	50 Hz	1.5	2.2	3.0	2.2	3.0	4.0	3.0	4.0	-	4.0	5.5	-
	60 Hz	1.8	2.6	3.6	2.6	3.6	4.8	3.6	4.8	-	4.8	6.5	9.0
A	50 Hz	8.7/5.0	12.1/7.0	14.9/8.6	12.1/7.0	15.9/9.2	19.0/11	15.9/9.2	19.0/11	-	19.0/11	23.5/13.5	-
	60 Hz	7.7/4.5	11.3/6.5	13.9/8.0	11.3/6.5	15.2/8.8	19.0/11	15.2/8.8	19.0/11	-	19.0/11	28.0/16.0	33.0/19.0
rpm	50 Hz	2850											
	60 Hz	3450											
dB(A)	50 Hz	68	68	68	68	70	72	71	71	-	71	71	-
	60 Hz	72	72.5	72.5	70	73	77	74	75	-	75	75	75
lbs		79	80	93	93	97	117	116	128	-	146	196	209

cfm	Capacity	Capacidad	Débit	Capacidade
in. water	Pressure difference	Diferencia de presión	Différence surpression	Pressão diferencial
V	Vacuum operation	Operación vacío	Fonction dépression	Operação do vácuo
3-	Motor version	Versión motor	Exécution moteur	Versão do motor
kw	Motor rating	Datos motor	Puissance moteur	Potência do motor
A	Full load amperage	Amperaje de plena carga	Intensité absorbée	Amperagem da carga total
rpm	Speed	Velocidad	Vitesse rotation	Velocidade
dB(A)	Average noise level (Discharge connected to a pipeline)	Nivel de ruido medio (Descarga conectada a tubería)	Niveau sonore moyen (Refoulement au travers d'un tuyau)	Nível médio de ruído (Descarga ligada a uma tubulação)
lbs	Weight	Peso	Poids	Peso



The curves have a tolerance of $\pm 10\%$ and are based on inlet conditions at 68°F and a barometric pressure of 29.92" HgA. Las curvas tienen una tolerancia del $\pm 10\%$ y trabajan con condiciones de entrada de 68°F y una presión de retroceso de 1 bar (abs.). Les courbes (tolérance $\pm 10\%$) sont établies pour de l'air aspiré à 68°F et une pression au refoulement de 29.92" HgA. As curvas têm uma tolerância de $\pm 10\%$ e estão relacionadas com as condições de admissão a 68°F e uma contra-pressão de 29.92" HgA.

Technical information is subject to change without notice. La información técnica está sujeta a cambios sin previo aviso. Sous réserve de modification technique. A informação técnica está sujeita a mudança sem aviso prévio.

on request # on pedido # sur demande # a pedido

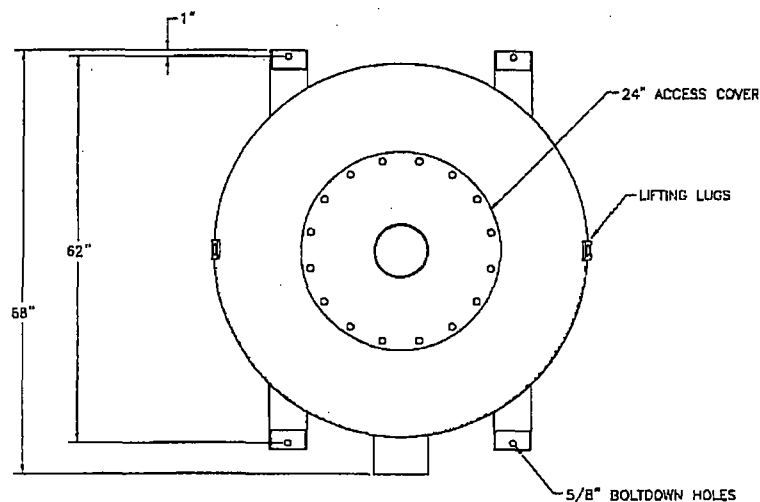
APPENDIX E

Air Treatment Equipment Specifications

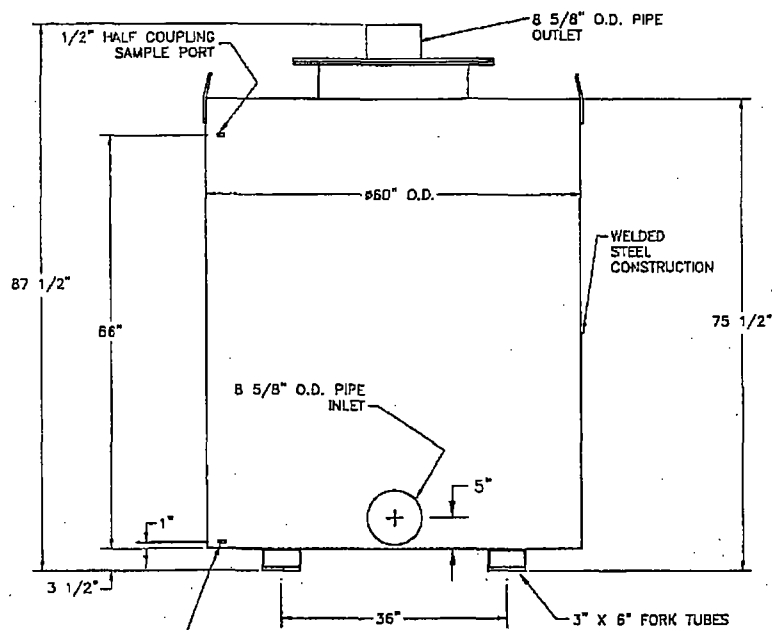


Gas Phase Carbon Absorber Vessel

GPC 20R



PLAN VIEW



ELEVATION

Vessel Specifications

Flow Range (cfm):	200 - 1800
Carbon Capacity (lb):	2000
Empty Weight (lb):	1200
Operating Weight (lb):	3200

Maximum Recommended Temperature (°F):	120
Minimum Temperature (°F):	34

Options

Hose Kits
Discharge Stack

Note: Actual dimensions and orientations may vary slightly than shown above.

MINNESOTA: (corp hdqtrs)

Carbonair
2731 Nevada Ave. N.
New Hope, MN 55427
PH: 800.526.4999
763.544.2154
FAX: 763.544.2151
Homepage: www.carbonair.com

FLORIDA:

Carbonair
4710 Dignan Street
Jacksonville, FL 32254
PH: 800.241.7833
904.387.4465
FAX: 904.387.5058

VIRGINIA:

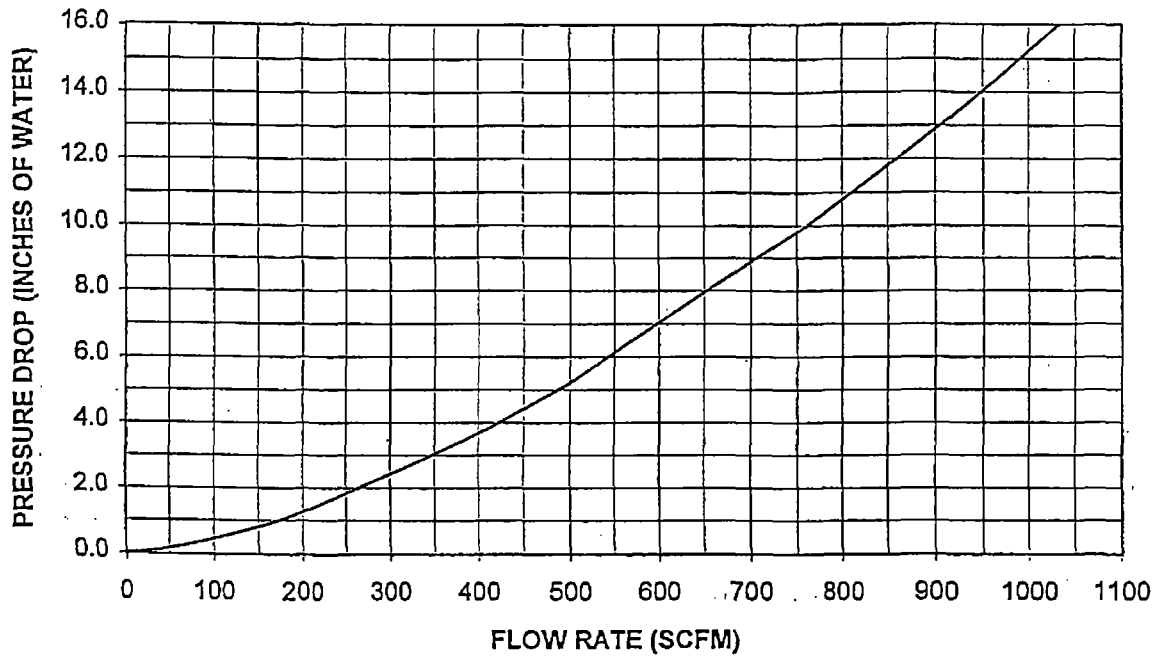
Carbonair
4328 West Main St.
Salem, VA 24153
PH: 800.204.0324
540.380.5913
FAX: 540.380.5920

TEXAS:

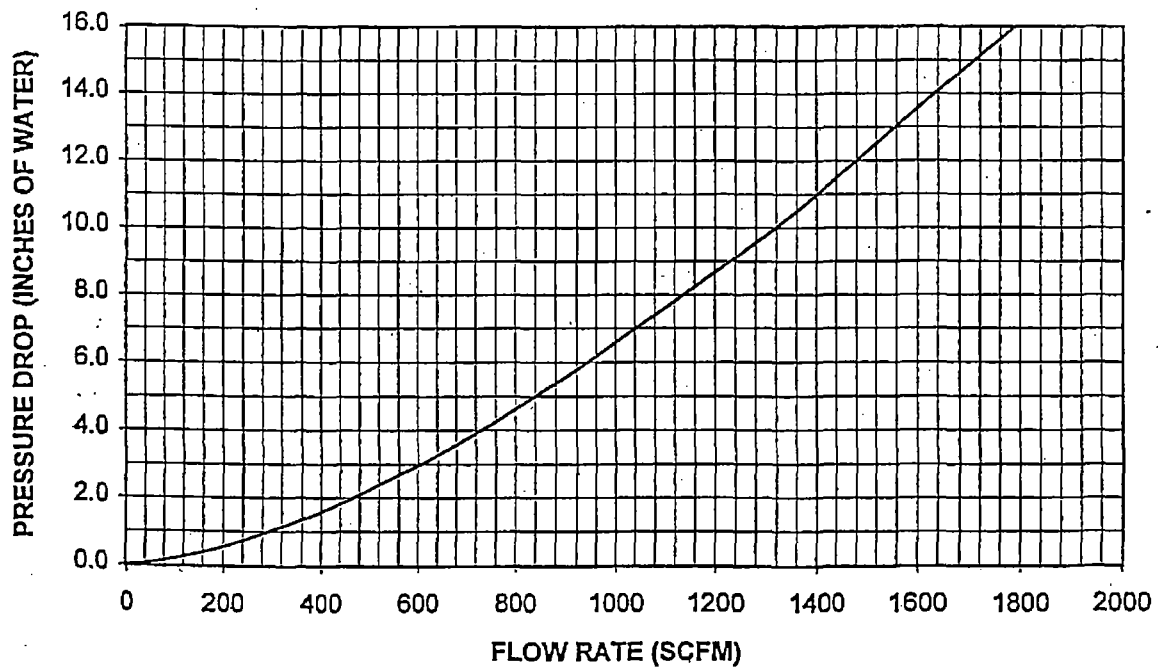
Carbonair
4889 Hunter Rd. Bldg I-C
San Marcos, TX 78666
PH: 800.893.5937
512.392.0085
FAX: 512.392.0066

PRESSURE DROP THROUGH CARBONAIR GAS-PHASE UNITS

GPC-13R



GPC-20R



APPENDIX F

Soil Vapor (Flammable, Maximum, and Average) VOC Loading Calculations

Air Sparge / Soil Vapor Extraction Design Calculations

Maximum Vapor Phase Concentration:

$$C_{V1MAX} = (X \cdot M_w \cdot P_v) / R \cdot T = H \cdot C_w$$

Where:

- X = mole fraction of compound in immiscible phase (moles / total moles)
- M_w = molecular weight of compound (mg / mole)
- P_v = vapor pressure of compound (atm)
- R = gas constant = 0.0821 L atm / mole • k
- T = absolute temperature (k)
- H = Henry's Law Constant = mg/L in air / mg/L in water
- C_w = dissolved concentration of compound (mg/L)

*see Table F.2 for calculations

Maximum Removal Rate by Volatilization:

$$R_{vc} = Q_{inj} \cdot C_{v1max} \text{ (lbs / hr)}$$

Where:

- Q_{inj} = approximate average total air injection flow rate (all wells) (ft³/min)
- C_{v1max} = maximum vapor phase concentration (mg/L)
- R_{vc} = Aggregate concentrations of R_{VLmax} for VOC compounds
- R_{VLmax} = (100 cfm) (5.64 mg/L_{1,1,1 DCA}) [6.243 x 10⁻⁵ (lbs/ft³)/(mg/L)]
 = 2.11 lbs/hr

*see Table F.2 for calculations

Average Vapor Phase Concentration:

$$C_{v1avg} = (X \cdot M_w \cdot P_v) / R \cdot T = H \cdot C_{w(avg)}$$

*see Table F.3 for calculations

Average Removal Rate by Volatilization

$$R_{v1cavg} = (100 \text{ cfm}) \cdot (1.233 \text{ mg/L}_{1,1 \text{ DCA}}) \cdot [6.243 \times 10^{-5} \text{ (lbs/ft}^3\text{)/(mg/L)}]$$

$$= 0.46 \text{ lbs/hr}$$

Source of Equations: A. Leeson, et al. 2002. *Air Sparging Design Paradigm*. Battelle.
 Columbus, Ohio. 12 August 2002.

TABLE F.1

SECOR

Flammable Vapor LEL Calculations
Southeast Rockford Groundwater Contamination Superfund Site
Area 9/10
Rockford, Illinois

Compound	Maximum Concentration (mg/L)	Henry's Constant (mg/l vapor/mg/l H ₂ O)	Maximum Volatilization Concentration (mg/l)	Maximum Vapor Concentration (ppmv)	LEL (%)	LEL (ppmv)
1,1 - DCA	30	0.188	5.640	1392.59	5.4	54000.0
1,1 - DCE	1.7	0.904	1.537	379.46	6.5	65000
1,2 - DCE Total	28	0.318	8.904	2242.82	5.6	56000.0
PCE	0.29	0.579	0.168	24.77	NA	NA
Xylenes	2.1	0.141	0.296	68.23	0.9	9000.0
1,1,1 - TCA	34	0.57	19.380	3273.81	7.5	75000.0
1,1,2 - TCA	0.011	0.0202	0.00022	0.04	6.0	6000.0
TCE	0.2	0.335	0.067	12.48	8.0	8000.0
VC	3.5	0.981	3.434	1341.21	3.6	3600.0

Total Maximum Vapor Concentration (ppmv)	8735.40
-------------------------------------------------	----------------

Maximum concentrations from 11/17/04 sampling event

TABLE F.2

SECOR

**Maximum Vapor Concentration
Southeast Rockford Groundwater Contamination Superfund Site
Area 9/10
Rockford, Illinois**

Compound	Maximum Concentration (mg/L)	Monitoring Well	Henry's Constant (mg/l vapor/mg/l H ₂ O)	Maximum Volatilization Concentration (mg/l)	Flowrate (SCFM)	Maximum Removal Rate (lbs/hr)	VOC ¹ (lbs/hr)	HAP ² (lbs/hr)
1,1 - DCA	30	SMW-20	0.188	5.640	100	2.11	2.11	
1,1 - DCE	1.7	SMW-21	0.904	1.537	100	0.58	0.58	
1,2 - DCE Total	28	SMW-20	0.318	8.904	100	3.34	3.34	
PCE	0.29	SMW-22	0.579	0.168	100	0.06	0.06	0.06
Xylene	2.1	SMW-21	0.141	0.296	100	0.11	0.11	0.11
1,1,1 - TCA	34	SMW-21	0.57	19.380	100	7.27		
1,1,2 - TCA	0.011	SMW-21	0.0202	0.00022	100	0.00008		
TCE	0.2	SMW-21	0.335	0.067	100	0.03	0.03	0.03
VC	3.5	SMW-20	0.981	3.434	100	1.29	1.29	1.29

Summary	lbs/hr	tons/yr
TOTAL	14.78	64.74
VOC TOTAL	7.52	32.94
HAP TOTAL	1.49	6.53

¹ Shaded cells exempt VOCs per 40 CFR 51.100

² Shaded cells not HAPs

Maximum concentrations from 11/17/04 sampling event

TABLE F.3

SECOR

Average Vapor Concentration
Southeast Rockford Groundwater Contamination Superfund Site
Area 9/10
Rockford, Illinois

Compound	Average Concentration (mg/L)	Henry's Constant (mg/l vapor/mg/l H ₂ O)	Average Volatilization Concentration (mg/l)	Flowrate (SCFM)	Maximum Removal Rate (lbs/hr)	VOC ¹ (lbs/hr)	HAP ² (lbs/hr)
1,1 - DCA	6.56	0.188	1.233	100	0.46	0.46	
1,1 - DCE	0.49	0.904	0.443	100	0.17	0.17	
1,2 - DCE Total	6.02	0.318	1.914	100	0.72	0.72	
PCE	0.06	0.579	0.035	100	0.01	0.01	0.01
1,1,1 - TCA	8.21	0.57	4.680	100	1.75		
1,1,2 - TCA	0.002	0.0202	0.00004	100	0.00		
Xylenes	0.57	0.141	0.08037	100	0.03	0.03	0.03
TCE	0.07	0.335	0.023	100	0.01	0.01	0.01
VC	0.7	0.981	0.687	100	0.26	0.26	0.26

Summary	lbs/hr	tons/yr
TOTAL	3.41	14.93
VOC TOTAL	1.66	7.27
HAP TOTAL	0.31	1.36

¹ Shaded Cells exempt VOCs per 40 CFR 51.100(s)

² Shaded Cells not HAPs

-Average concentrations calculated from 11/18/04
analytical data from monitoring wells MW-201,
SMW-6, SMW-20, SMW-21, and SMW-22

APPENDIX G

Final Outside Container Storage Area Source Mass Reduction Work Plan

**Final Outside Container Storage Area
Source Material Mass Reduction Work Plan**

Remedial Design

Area 9/10

Southeast Rockford Groundwater Contamination

Superfund Site

Rockford, Illinois

CERCLIS ID No. ILD981000417

March 31, 2007

Prepared for:

Hamilton Sundstrand Corporation

4747 Harrison Avenue

Rockford, Illinois 61125

Submitted by:



SECOR

SECOR International Incorporated

446 Eisenhower Lane North

Lombard, Illinois 60148

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SECTION 1.0 INTRODUCTION

This Outside Container Storage Area (OSA) Source Material Mass Reduction Work Plan (SMMRWP) presents the rationale, procedures, and methods to address in part the Southeast Rockford Source Control Operable Unit identified as Area 9/10W in the Area 9/10 portion of the Southeast Rockford Groundwater Contamination Superfund Site (SER site) located in the City of Rockford, Illinois (Figure 1.1). The term "Site" refers to Area 9/10, an industrial area in Rockford, Winnebago County, Illinois, that is bounded by Eleventh Street on the east, Twenty-third Avenue on the north, Harrison Avenue on the south, and Sixth Street on the west. The OSA was operated as a RCRA hazardous waste storage facility by the Hamilton Sundstrand Corporation (HS) Plant #1 facility which is located within Area 9/10 at 2421 Eleventh Street. Figure 1.2 depicts a site map of the HS facility. This SMMRWP provides a detailed description of activities to be implemented in the OSA area. The OSA site features are shown on Figure 1.3.

HS is working with the United States Environmental Protection Agency (USEPA) and the Illinois Environmental Protection Agency (IEPA) in accordance with the Administrative Order on Consent (AOC) for Remedial Design for Area 9/10 signed on January 13, 2003 and the Record of Decision (ROD) relating to source control for the SER site which was signed on June 11, 2002. As part of the remedial design process, a Pre-Design Investigation (PDI) was completed in the vicinity of and on the HS property, including the OSA. A pilot test of the selected ROD technologies, soil vapor extraction and air sparging, was also conducted at the OSA.

The investigation and pilot study results indicated that the majority of source material with the future potential to impact groundwater within the OSA is located in the near surface soils.

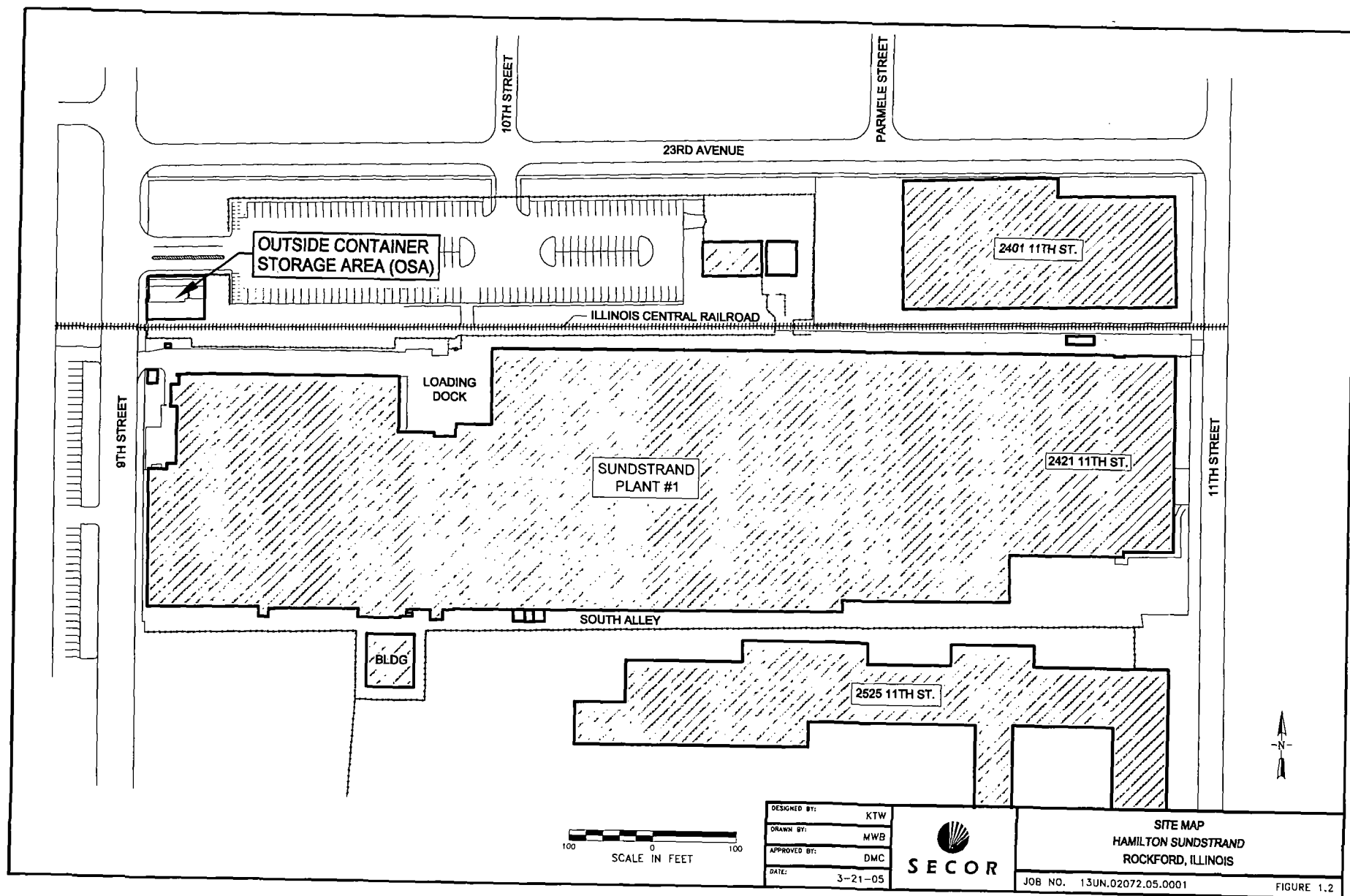
This proposed effort has been identified as an opportunity to provide practical support for the overall action to be taken in Area 9/10 and the overall SER site to address source control with respect to the Operable Unit Three ROD with a specific focus on the OSA.

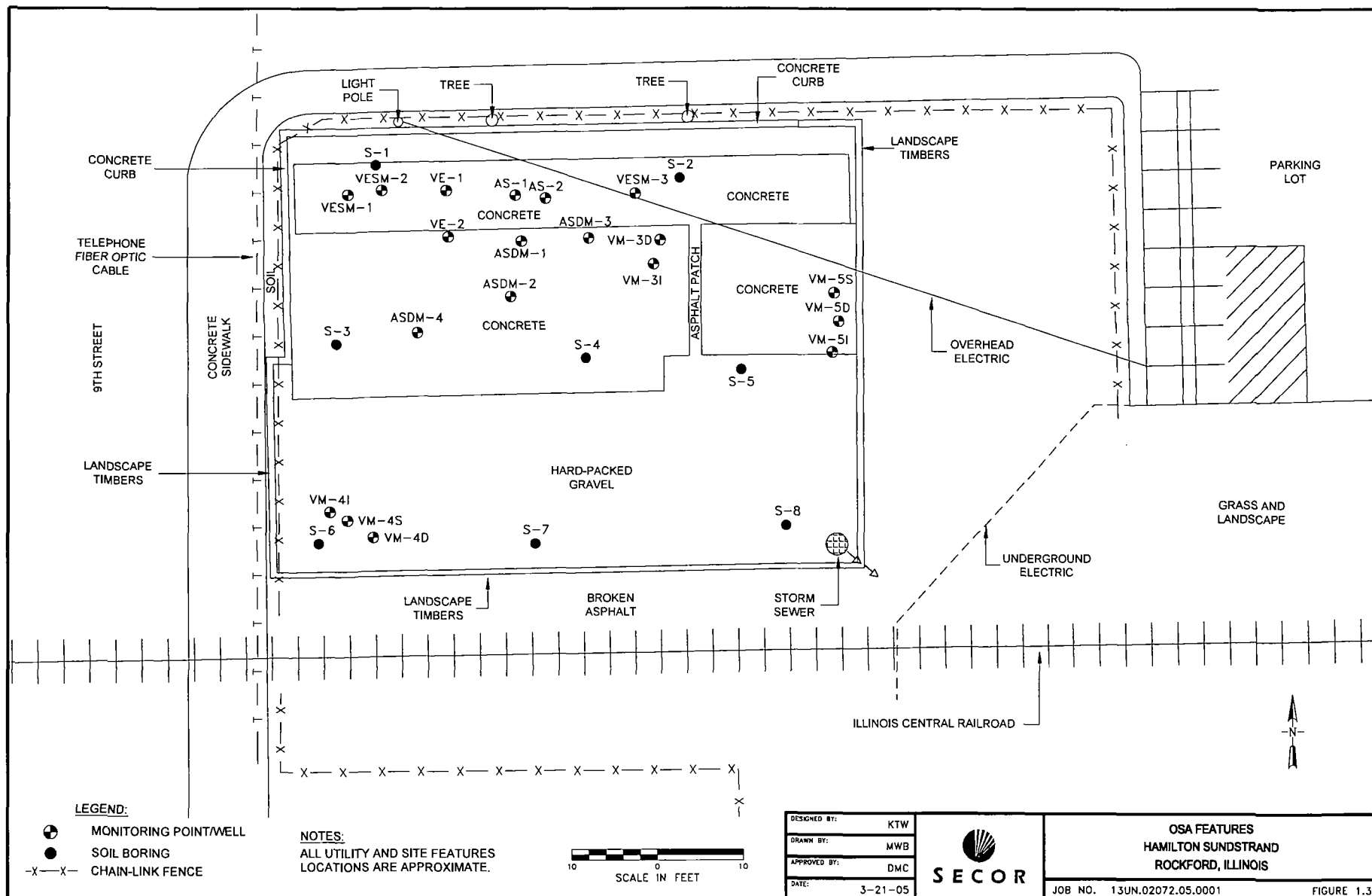
SOURCE MATERIAL MASS REDUCTION OBJECTIVES

The objective of this work plan is to address a substantive portion of the source material identified at the OSA. The implementation of the activities outlined in this plan will help meet the goals the ROD established for Area 9/10. This will be accomplished by the following:

- Contaminant mass removal by excavation and off-Site disposal of source material;
- Enhancement of natural attenuation ongoing at the Site; and
- Limiting water infiltration by construction of a clay cap over the OSA.

The SMMRWP work plan was initially dated and submitted to USEPA on April 27, 2005. Correspondence addressing Agency (USEPA and IEPA) comments was submitted on June 28, 2005. The USEPA approved the work plan with modifications in a letter dated August 15, 2005. This final work plan has been revised to incorporate the Agency comments and requested modifications. Copies of the USEPA work plan approval letter and the response to Agency comments are provided in Appendix A. This document has since been included in the Remedial Design. The plan has been revised to incorporate the response to IEPA comments on the remedial design. The IEPA letter was dated August 31, 2006 and the response letter was dated October 31, 2006.





OSA SOURCE MATERIAL EXCAVATION RATIONALE

There are several contributing factors in the decision to excavate the impacted soils in this area and dispose of them offsite. Excavation offers immediate, quantifiable, and unequivocal results. Other factors include:

- Tetrachloroethene present at concentrations above the soil saturation limit (C_{sat}) in shallow soils would be difficult and impractical to remediate using soil vapor extraction (SVE);
- Silty clay from the ground surface to a depth of approximately six feet will severely restrict airflow in the most impacted shallow soil zone;
- SVE for near surface soil remediation typically is susceptible to short circuiting of airflow from above ground and elicits a small radius of influence (ROI); and,
- Metals above ROs were detected in samples collected in the OSA that would not be addressed by other methods evaluated and identified in the ROD such as SVE;

The SVE Pilot Test performed in November 2003, and reported in the Pilot Test Summary Report dated October 2004, confirmed these technical challenges and limitations at the OSA with respect to shallow (near surface) soil impacts.

DESCRIPTION AND USE OF THE OSA

The OSA consists of a concrete pad approximately 30 feet wide by 65 feet long and a gravel area immediately south of the pad. The entire area of the OSA is 50 feet wide by 65 feet long. The OSA was used historically for the storage of a variety of waste materials including wastes stored in drums and bins of metal chips which contained non-hazardous coolants and cutting oils. The OSA is located in the northwest portion of the HS facility adjacent to the public right of way (concrete sidewalk) east of 9th Street. The area is surrounded by a chain link security fence.

HISTORICAL ACTIVITIES AT THE OSA

Historically, the pad had been constructed with a collection trench and underground drain line that connected to an underground storage tank (Tank #24). The underground drain line was removed in 1990 and the tank was removed in 1992. Minor portions of the concrete pad were removed to facilitate these activities. The concrete pad was sloped northward so that any liquids would drain into the collection trench. The collection trench was reportedly three feet wide, 60 feet long and eight inches deep. The collection trench, and OSA in general, was filled with pea gravel after being taken out of service for aesthetic purposes. When the OSA was in operation, the concrete pad area was covered by a metal corrugated roof supported by steel trusses and columns. This overhead structure has since been removed.

SITE GEOLOGY

The OSA concrete pad and gravel area surface cover are underlain by silty clay to a depth of approximately six feet. The clay overlies a poorly graded medium sand with occasional gravel layers and extends to a depth of greater than 140 feet. A thin, 1.5 to 4.0 feet thick silt layer, beginning at a depth of about 19 feet bgs, has been identified in this area. This silt layer is laterally discontinuous and is not present at boring locations to the south and east of the OSA. The water table is approximately 32 feet below ground surface (bgs).

CONSTITUENTS OF CONCERN

Based on the remedial investigation results and the preliminary remediation goals stated in the ROD, the constituents of concern (COCs) for Area 9/10 consist of volatile organic compounds (VOCs) and petroleum hydrocarbons associated with jet fuel. Previous sampling at the OSA also identified metals above the 35 IAC Part 742 Tiered Approach to Corrective Action Objectives (TACO) residential and commercial/industrial remediation objectives (ROs).

SECTION 2.0 OSA INVESTIGATION AND DATA EVALUATION

As part of the Area 9/10 remedial design activities, additional investigation was performed at the OSA to better understand the target constituent concentrations and their distribution within the soil matrix. Also, air sparge and SVE infrastructure was installed and pilot tested to identify the technical requirements and challenges to address the COCs.

2003 PRE-DESIGN INVESTIGATION AND PILOT STUDIES

In October 2003, a subsurface investigation was conducted at the OSA to provide a *current condition assessment of constituents in soil*. This investigation consisted of eight soil borings (S-1 through S-8) at the locations shown on Figure 1.3. Each of these borings extended to near the groundwater table at 30 to 32 feet bgs. Soil samples were collected in accordance with the approved Field Sampling Plan, dated March 31, 2003, and submitted to STL Laboratory in University Park, Illinois. Samples were analyzed for VOCs by Method 8260B; TCLP metals by SW-846 Methods 1311/6010B/7040A/7470A; and total petroleum hydrocarbons (TPH) consisting of diesel range organics (DRO) by Method 8015B MDRO. A summary of the analytical results is presented in Appendix B. These summary tables were also provided in the PDI Preliminary Results Summary Presentation Materials dated August 10, 2004 and the PDI Report dated April 28, 2006.

SVE and air sparge pilot testing was conducted in Fall 2003 using new and existing wells. In total, there are 17 extraction wells and monitoring points in the vadose zone and two air sparge wells screened within the saturated zone. The locations of these wells are shown on Figure 1.3. The test results and a compilation of all information collected were summarized in the Pilot Test Summary Report dated October 1, 2004 and submitted to USEPA. The pilot testing confirmed that significant air flow can be induced in this area under relatively low applied vacuums in the vadose zone; however, limited airflow was observed in the shallow soils where the majority of the contaminant mass was identified. These technologies also do not address metals contamination.

SOIL ANALYTICAL RESULTS EXCEEDING ROS

The soil analytical results were compared to the Preliminary Remediation Goals (PRGs) specified in the ROD dated June 11, 2002. The PRGs were derived from TACO Tier 1 residential and industrial/commercial ROs. However, they are not exposure pathway specific. To provide greater awareness of the potential for exposure the constituents exceeding ROs are identified based on pathway specific exposure routes as identified in TACO. The following constituents exceeded the soil component of the groundwater ingestion pathway: cadmium, lead, 1,1-dichloroethene (1,1 DCE), 1,2-dichloroethene (1,2 DCE), 1,1,1-trichloroethane (1,1,1 TCA), 1,1,2-trichloroethane (1,1,2 TCA), trichloroethene (TCE), and tetrachloroethene (PCE) in one or more OSA soil sample intervals. TCE and PCE also exceeded the inhalation pathway ROs and PCE exceeded the ingestion RO.

AVERAGED SOIL RESULTS AND MASS ESTIMATION

To identify potential source material soil concentrations were averaged using the 35 IAC Part 742.225(c) methodology. This resulted in continuous interval soil sample results which were averaged at each boring location. The averaged soil results indicated there are COCs above ROs. If constituents were below the method detection limit, one-half of the reporting limit was used as the value for averaging purposes. As a simplifying assumption, all of the samples from each boring were used to determine average concentrations, regardless of the number of times the COC was detected. A summary of the COCs is provided in Table 2.1. The COCs which exceeded the ROs after averaging of the samples were cadmium, lead, 1,1 DCE, 1,2 DCE, 1,1,1 TCA, 1,1,2 TCA, TCE, and PCE.

TABLE 2.1
OSA SOIL ANALYTICAL RESULTS AVERAGED BY BORING
AREA 9/10

SECOR

SOUTHEAST ROCKFORD GROUNDWATER CONTAMINATION SUPERFUND SITE
ROCKFORD, ILLINOIS

Boring Number	Constituents Exceeding ROs	PRGs/TACO Soil Remediation Objectives (ROs)	Constituent Maximum Concentration	Constituent Average Concentration Entire Boring
S-1	1,1-Dichloroethene	0.06	0.560	0.057
	1,2-Dichloroethene (total)	0.4	12.000	1.462
	Tetrachloroethene	0.06	360.000	34.206
	1,1,1-Trichloroethane	2	220.000	24.090
	Trichloroethene	0.06	18.000	1.877
	Lead	0.0075	0.009	0.004
S-2	1,1-Dichloroethene	0.06	1.300	0.098
	1,2-Dichloroethene (total)	0.4	7.200	0.542
	Tetrachloroethene	0.06	320.000	21.661
	1,1,1-Trichloroethane	2	240.000	16.100
	Trichloroethene	0.06	20.000	1.358
	Cadmium	0.005	0.012	0.003
S-3	1,2-Dichloroethene (total)	0.4	0.750	0.063
	Tetrachloroethene	0.06	20.000	1.339
	1,1,1-Trichloroethane	2	4.800	0.366
	Trichloroethene	0.06	0.450	0.036
	Cadmium	0.005	0.010	0.003
S-4	1,2-Dichloroethene (total)	0.4	0.450	0.112
	Tetrachloroethene	0.06	5.100	0.939
	Trichloroethene	0.06	0.310	0.066
	Cadmium	0.005	0.160	0.022
S-5	Tetrachloroethene	0.06	8.100	1.165
	Trichloroethene	0.06	0.190	0.031
	Cadmium	0.005	3.900	0.340
	Lead	0.0075	0.043	0.008
S-6	Tetrachloroethene	0.06	0.140	0.034
	Cadmium	0.005	0.008	0.003
	Lead	0.0075	0.110	0.010
S-7	Tetrachloroethene	0.06	49.000	3.299
	1,1,1-Trichloroethane	2	12.000	0.891
	Trichloroethene	0.06	0.670	0.048
	Lead	0.0075	0.028	0.005
S-8	Tetrachloroethene	0.06	2.800	0.240
	1,1,2-Trichloroethane	0.02	0.500	0.036
	Trichloroethene	0.06	0.110	0.011
	Cadmium	0.005	0.047	0.007

Notes:

VOC analysis by Method 8260B results are presented in mg/kg.

Metals results are from a TCLP extract and are presented in mg/l.

1) Preliminary Remediation Goals (PRGs) and Tier I Residential Soil Migration to Class I Groundwater; Tiered Approach to Corrective Action Objectives.

2) Average concentrations based on 1/2 the reporting limit for constituents that were not detected.

3) Constituent Concentrations in Soil Meet PRGs and TACO Tier I ROs.

4) Constituent Concentrations in Soil Exceed PRGs and TACO Tier I ROs.

5) 1,2 DCE (Total) ROs based on cis-1,2 DCE (more conservative than trans-1,2 DCE).

6) Due to averaging of results all concentrations are presented to the nearest 0.001

7) Soil Averaging based data from the interval of 0-32 feet except S-1 which is 0-34 feet.

The continuous depth interval sampling was used to identify the depth of potential source material at each boring. To facilitate this effort, the OSA area was divided into eight subareas, their boundaries being half way between the boring locations. The analytical data from each boring was considered representative of that subarea. This approach was used to develop a general estimate of the overall contaminant mass in place and determine what mass may potentially remain after the excavation and removal of impacted soil at each subarea in two foot lifts.

OSA EXCAVATION SUBAREAS AND TARGET DEPTHS

The removal of impacted soil to a minimum target depth of four feet is planned. The target depth for excavation of each subarea is shown on Figure 2.1. The actual depth of soil to be removed in each subarea will be based on health and safety considerations and preservation of the structural integrity of existing infrastructure including utilities onsite and adjacent to the OSA. A comparison of the post excavation average soil concentrations and ROs is provided in Table 2.2.

MASS OF POST EXCAVATION SOURCE MATERIAL REMOVED BY EXCAVATION

Upon completion of the excavation activities, assuming the target excavation depths are attained, the majority of soil containing elevated cadmium, lead, 1,1 DCE, 1,2 DCE, 1,1,1 TCA, 1,1,2 TCA, TCE, and PCE will have been removed, based on the current (S-1 through S-8) soil boring data. After the completion of this source removal effort it appears PCE will be the only VOC which will exceed the ROs. A comparison of the estimated mass of PCE currently in place and an estimate to remain after excavation is provided in Table 2.3. The estimate of PCE removal is believed to be greater than 95% of the initial mass.

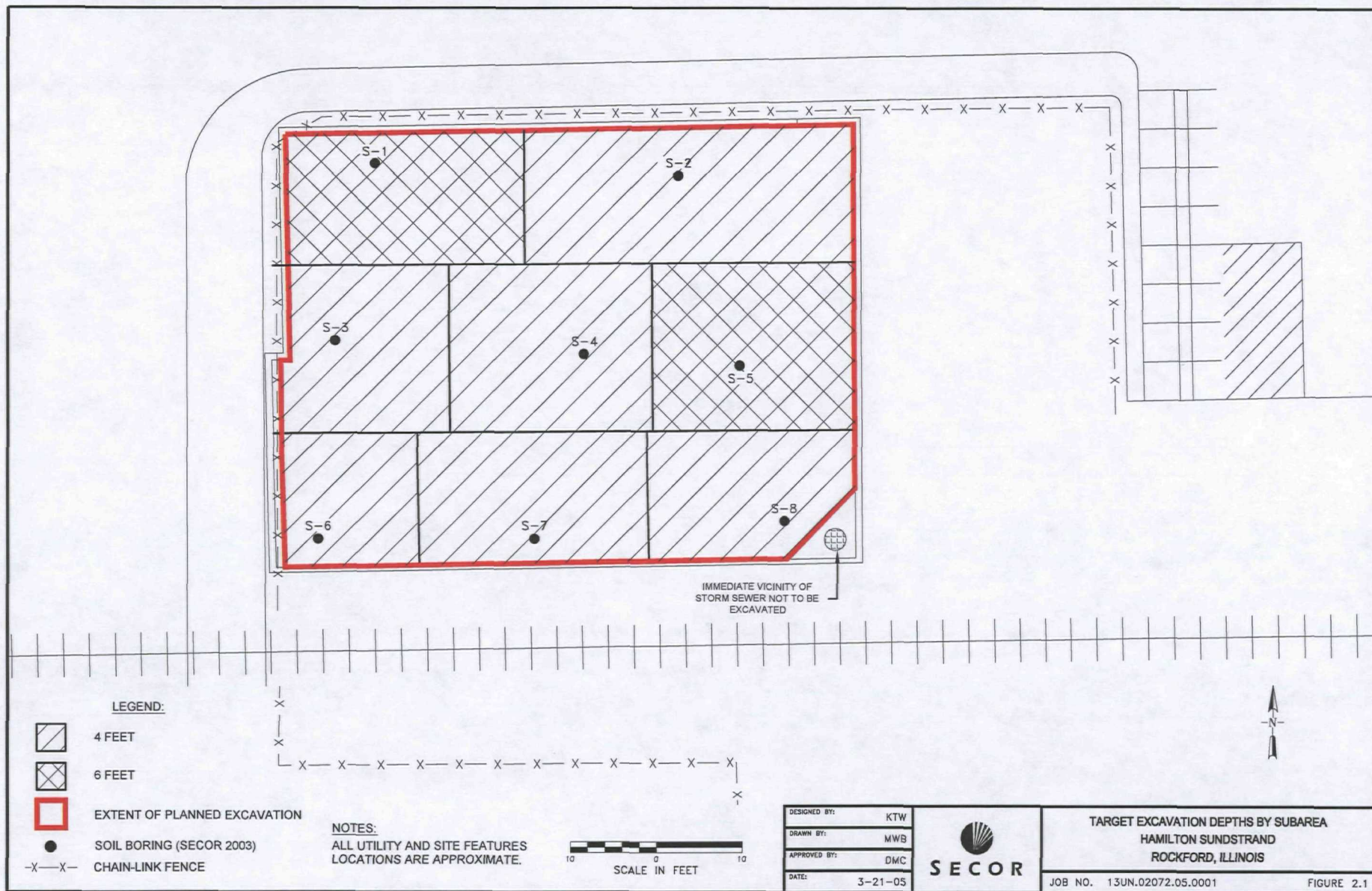


TABLE 2.2
OSA POST EXCAVATION AVERAGE SOIL CONCENTRATIONS
AREA 9/10

SECOR

SOUTHEAST ROCKFORD GROUNDWATER CONTAMINATION SUPERFUND SITE
ROCKFORD, ILLINOIS

Boring Number	Constituents Exceeding ROs	PRG/TACO Soil Remediation Objectives (ROs)	Constituent Average Concentration w/ Excavation of 2 Feet	Constituent Average Concentration w/ Excavation of 4 Feet	Constituent Average Concentration w/ Excavation of 6 Feet
S-1	1,1-Dichloroethene	0.06	0.057	0.046	0.006
	1,2-Dichloroethene (total)	0.4	1.462	0.709	0.041
	Tetrachloroethene	0.06	34.206	10.935	0.238
	1,1,1-Trichloroethane	2	24.090	10.096	0.104
	Trichloroethene	0.06	1.877	0.725	0.012
	Lead	0.0075	0.004	0.004	0.004
S-2	1,1-Dichloroethene	0.06	0.098	0.012	0.009
	1,2-Dichloroethene (total)	0.4	0.542	0.067	0.051
	Tetrachloroethene	0.06	21.661	0.351	0.293
	1,1,1-Trichloroethane	2	16.100	0.107	0.087
	Trichloroethene	0.06	1.358	0.026	0.019
	Cadmium	0.005	0.003	0.003	0.003
S-3	1,2-Dichloroethene (total)	0.4	0.064	0.016	0.014
	Tetrachloroethene	0.06	1.426	0.099	0.107
	1,1,1-Trichloroethane	2	0.388	0.073	0.066
	Trichloroethene	0.06	0.036	0.006	0.006
	Cadmium	0.005	0.003	0.003	0.003
S-4	1,2-Dichloroethene (total)	0.4	0.098	0.069	0.069
	Tetrachloroethene	0.06	0.619	0.304	0.304
	Trichloroethene	0.06	0.049	0.029	0.021
	Cadmium	0.005	0.024	0.025	0.027
S-5	Tetrachloroethene	0.06	1.165	1.127	0.591
	Trichloroethene	0.06	0.031	0.030	0.017
	Cadmium	0.005	0.340	0.086	0.092
	Lead	0.0075	0.008	0.009	0.008
S-6	Tetrachloroethene	0.06	0.033	0.026	0.021
	Cadmium	0.005	0.003	0.003	0.003
	Lead	0.0075	0.011	0.004	0.004
S-7	Tetrachloroethene	0.06	3.299	0.035	0.031
	1,1,1-Trichloroethane	2	0.891	0.037	0.029
	Trichloroethene	0.06	0.048	0.004	0.004
	Lead	0.0075	0.005	0.004	0.004
S-8	Tetrachloroethene	0.06	0.240	0.057	0.050
	1,1,2-Trichloroethane	0.02	0.036	0.002	0.002
	Trichloroethene	0.06	0.011	0.004	0.003
	Cadmium	0.005	0.007	0.007	0.006

Notes:

VOC analysis by Method 8260B results are presented in mg/kg.

Metals results are from a TCLP extract and are presented in mg/l.

1) Preliminary Remediation Goals (PRGs) and Tier I Residential Soil Migration to Class I Groundwater; Tiered Approach to Corrective Action Objectives.

2) Average concentrations based on 1/2 the Reporting limit for constituents that were not detected.

3) Constituent Concentrations in Soil Meet PRGs and TACO Tier I ROs.

4) Constituent Concentrations in Soil Exceed PRGs and TACO Tier I ROs.

5) 1,2 DCE (Total) ROs based on cis-1,2 DCE (more conservative than trans-1,2 DCE).

6) Due to averaging of results all concentrations are presented to the nearest 0.001

7) Soil averaging assumes the interval 0-32 feet except S-1 which is 0-34 feet.

8) Bold cell border indicates target excavation depth

TABLE 2.3
ESTIMATE OF TETRACHLOROETHENE MASS IN SOIL
OUTSIDE STORAGE AREA
PRE AND POST EXCAVATION
AREA 9/10
SOUTHEAST ROCKFORD GROUNDWATER CONTAMINATION SUPERFUND SITE
ROCKFORD, ILLINOIS

Subarea and Boring Location Number	Average Concentration (mg/kg)	Estimate of Soil Mass in Place (kg)	Estimate of PCE Mass in Place (mg)	Target Excavation Depth (ft)	Average Post Excavation Concentration (mg/kg)	Estimate of Mass Impacted Soil Remaining in Place (kg)	Estimate of Mass of PCE Remaining in Place (mg)	Percentage of PCE Mass Remaining	Percentage of Mass Reduction by Excavation
S-1	32.070	704389	22589755	6	0.238	572316	136211	0.006	0.994
S-2	21.660	991362	21472907	4	0.351	867442	304472	0.014	0.986
S-3	1.340	588621	788753	4	0.099	515044	50989	0.065	0.935
S-4	0.940	712542	669789	4	0.304	623474	189536	0.283	0.717
S-5	1.170	712542	833674	6	0.591	578940	342154	0.410	0.590
S-6	0.034	391327	13305	4	0.026	342411	8903	0.669	0.331
S-7	3.300	635907	2098492	4	0.035	556418	19475	0.009	0.991
S-8	0.240	562533	135008	4	0.057	492216	28056	0.208	0.792
TOTALS	9.171	5299223	48601684		0.237	4548262	1079796	0.022	0.978

Estimate of PCE in Soil:

48.602 kg PCE
107.147 lbs PCE
7.885 gallons PCE

Estimate of PCE Remaining in Soil:

1.080 kg PCE
2.381 lbs PCE
0.175 gallons PCE

Notes:

- 1) Average concentration based on 0-32 feet interval. Mass calculations are proportional to length and width of each subarea.
- 2) Uses the TACO Bulk Density for sand of 1.8 g/cm³ which converts to 3033 lbs/yd³.
- 3) 8.337 lbs of water per gallon.
- 4) 1.63 Specific Gravity of PCE and Water 1.00.

Methodology:

- 1) Average Concentrations (mg/kg) = measured during sampling.
- 2) Estimate of Soil Mass in place (kg) = Sub area (ft²) x Depth (ft)/27 (ft³) x 3,033 (lbs/yd³) of sand/2.2046 (lb/kg).
- 3) Estimate of PCE Mass in place (mg) = Average Concentration (mg/kg) x Estimate of Soil Mass in place (kg).
- 4) Target Excavation Depth (ft) = Measured
- 5) Average Post Excavation Concentration (mg/kg) = Measured
- 6) Estimate of Mass Impacted Soil Remaining in Place (kg) = Sub Area (ft²) x [Depth (ft) - Target Excavation Depth (ft)]/27 (ft³) x 3,033 (lbs/yd³) of sand/2.2046 (lb/kg).
- 7) Estimate of Mass of PCE Remaining in Place (mg) = Average Post Excavation Concentration (mg/kg) x Estimate of Mass Impacted Soil Remaining in Place (kg).
- 8) Percentage of PCE Mass Remaining = Estimate of Mass of PCE Remaining in Place (mg)/Estimate of PCE Mass in Place (mg).
- 9) Percentage of Mass Reduction by Excavation = 1-Percentage of PCE Mass Remaining.

Based on the current data, the remaining PCE concentrations in soil are not anticipated to exceed the inhalation or ingestion pathway ROs (from TACO) and will likely be within an order of magnitude of the soil component of the groundwater ingestion pathway PRG/TACO RO. The averaged concentrations of cadmium will still exceed the soil component of the groundwater ingestion pathway (PRG/TACO) RO at locations S-4 and S-5 due to elevated concentrations at depth. The averaged lead concentration at S-5 will be 0.008 mg/l and below the soil component of the groundwater ingestion pathway TACO RO of 0.0075 at all other locations.

NATURAL ATTENUATION ENHANCEMENT OPPORTUNITY IDENTIFIED

Based on the information collected in conjunction with the SVE and air sparge pilot tests, there appears to be an opportunity to enhance the natural attenuation in groundwater beneath the OSA. Based on pilot test data, the dissolved oxygen levels in groundwater indicate aerobic conditions. By reducing the dissolved oxygen level in groundwater, anaerobic conditions may be created. These conditions are much more favorable to bacteria which facilitate the reductive dechlorination process.

SECTION 3.0 METHODS AND PROCEDURES

The methods and procedures for completion of the work plan activities including health and safety plan updates, work zone delineation, natural attenuation enhancement, well abandonment, and the excavation, loading, transportation and waste disposal are presented in this section.

HEALTH AND SAFETY PLAN, SITE SECURITY, AND WORK ZONES

The existing SECOR Health and Safety Plan will be revised and updated to include the activities outlined in this work plan. The revisions to the plan will include, but are not limited to, excavation activities, field monitoring equipment and activities, required personal protective equipment (PPE), minimum levels of protection and criteria for upgrade, and excavation sampling procedures.

Site security and work zones will be established. HS has security personnel that restrict access to the facility. There is a guard post located south of the OSA. The chain link security fence around the OSA will be partially removed to facilitate the excavation activities and integration of the area into the facility after completion of the work. Temporary fencing will be used to create exclusion and decontamination zones around the OSA and to block access from HS personnel and others. Permission to close the sidewalk and a portion of a drive lane on 9th Street adjacent to the OSA, as necessary, will be sought from the City of Rockford. If roadway closure is granted by the City of Rockford, a larger exclusion area will be created using the aforementioned fencing and appropriate lane closure signage (based on current IDOT standards). A site layout identifying the approximate exclusion, decontamination, and support work zones is provided as Figure 3.1.

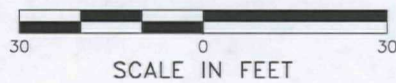
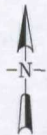
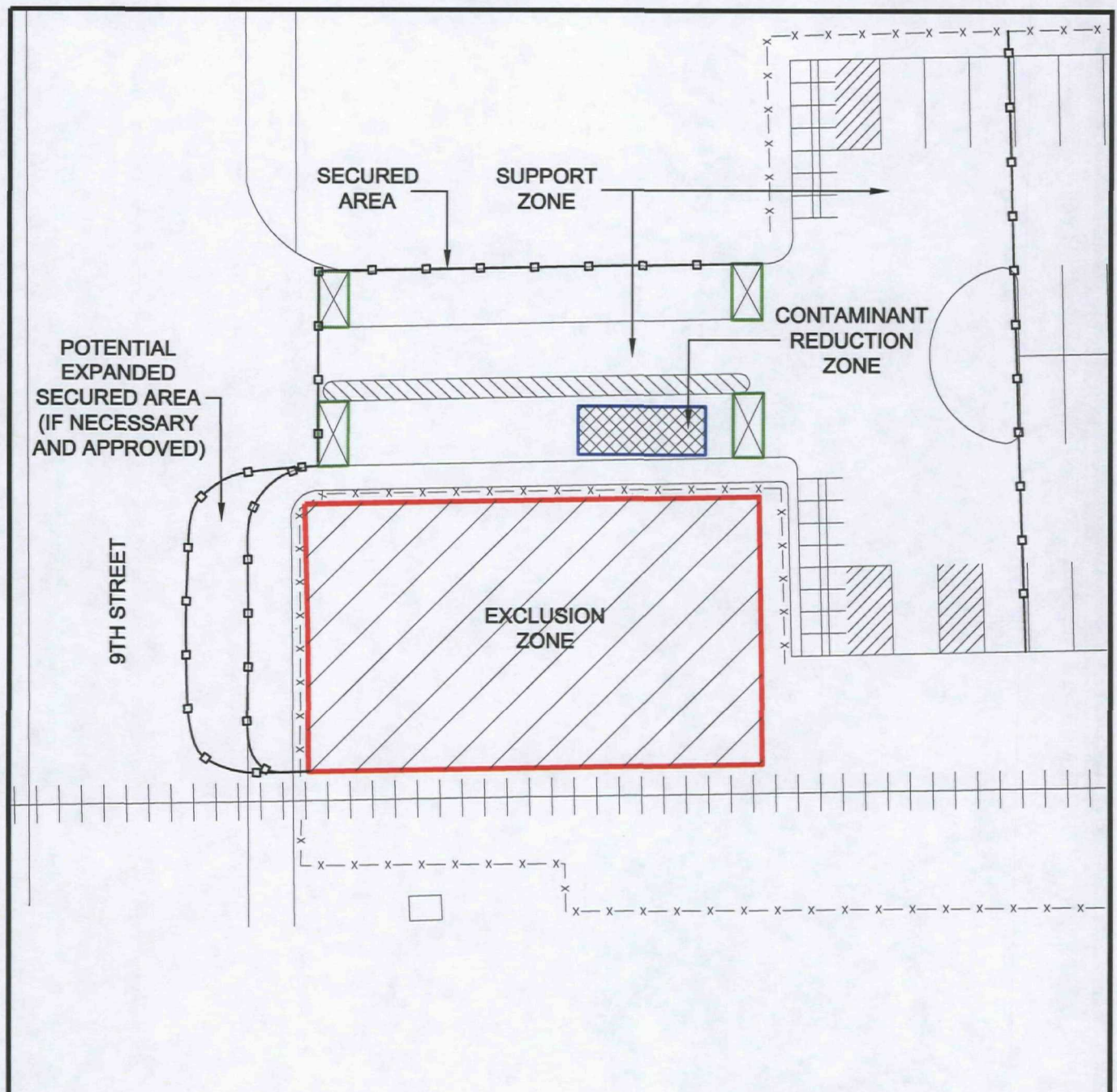
The proximity of the excavation to structures and utilities will require that special care be taken to avoid damaging or in any way compromising the integrity of the adjacent infrastructure. In some areas, excavation walls may require shoring, benching or sloping. This may limit the depth or areal extent of excavations.

All excavations shall be made in accordance with the rules, regulations, requirements, and guidelines set forth in 29 CFR 1926.650 through 1926.652 established by the Occupational Safety and Health Administration for Excavations.

Excavations will be inspected by a competent person to assure that side walls are stable and do not pose a threat to personnel, equipment, or surrounding infrastructure. Inspections will be conducted on the following schedule, at a minimum:



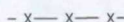

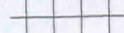
- Daily and before the start of each shift.
- As dictated by the work being done.
- After every rain storm.
- After other events that could increase hazards, such as snowstorm, windstorm, thaw, earthquake, dramatic change in weather, etc.
- When fissures, tension cracks, sloughing, undercutting, water seepage, bulging at the bottom, or other similar conditions occur.
- When there is any indication of change or movement in adjacent structures.

Upon completion of the excavation, backfilling, and transportation of all wastes offsite, all temporary fencing will be removed. During the excavation activities, portions of the security fence may be removed to facilitate the completion of the work. If this is necessary, adequate substitute fencing will be provided as necessary to restrict access.



NOTE: THE LOCATIONS AND BOUNDARIES OF THE WORK ZONES ARE APPROXIMATE AND SUBJECT TO MODIFICATIONS BASED ON FIELD CONDITIONS.

LEGEND:

-  ACCESS CONTROL POINTS
-  DECONTAMINATION STATION/PAD
-  CHAIN-LINK FENCE
-  TEMPORARY FENCING
-  RAILROAD TRACK

DESIGNED BY: KTW
 DRAWN BY: MWB
 APPROVED BY: DMC
 DATE: 03-21-05



EXCAVATION WORK ZONES
 HAMILTON SUNDSTRAND
 ROCKFORD, ILLINOIS

JOB NO. 13UN.02072.05.0001

FIGURE 3.1

AIR MONITORING

Ambient and personal breathing space air monitoring will be undertaken as part of this effort. The site specific health and safety plan for the continuing work at this facility will be amended to incorporate the excavation activities. Air monitoring using an 11.7 eV photoionization detector (or equivalent) will be implemented within the work zone and periodically at the work zone perimeter. Threshold levels will be established for worker upgrades in level of PPE and for cessation or modification of work practices if certain trigger values are reached in the perimeter monitoring program. If concentrations of volatile organic compounds are detected at the property line on a sustained basis in excess of one ppm above background the corrective action measures and contingency planning options will be reviewed and implemented.

CORRECTIVE ACTION MEASURES AND CONTINGENCY PLANNING

Corrective action measures and contingency planning options are proposed to ensure that HS employees and the general public are not exposed to potentially harmful levels of airborne contamination. If sustained VOC emissions are observed at the property line at levels above one ppm background the following options will be reviewed to determine the most appropriate and effective means to reduce airborne emissions:

- 1) Temporary cessation of work;
- 2) Modification of excavation methods to reduce the surface area of impacted soil exposed to the atmosphere;
- 3) Modification of other excavation methods or practices which facilitate the volatilization of constituents;
- 4) Use of vapor suppressing foam, water, or other liquids or gases;
- 5) Reevaluate the work zone perimeter and expand the exclusion and other work zones as appropriate to minimize the potential for exposure to the public; and
- 6) Alter the pace, location, or material loading procedures.

NATURAL ATTENUATION ENHANCEMENT

To take advantage of the existing network of pilot testing points/wells in place in the OSA, a groundwater amendment will be introduced to create more favorable natural attenuation conditions. These wells are within or in close proximity of the water table and provide an opportunity to introduce a natural attenuation enhancement product fairly evenly over the OSA area through the existing infrastructure prior to the abandonment of the wells.

A Regensis® product, Hydrogen Release Compound Extended Release Formula (HRC-X), will be introduced into the groundwater underlying the OSA through the screened portion of the existing access points (wells). HRC-X is a glycerol polylactate product which slowly releases hydrogen into groundwater for an extended period of time and creates anaerobic conditions which facilitate the biodegradation process for chlorinated volatile organic compounds.

The product is a water soluble, non toxic, food-grade material which was designed to be environmentally safe. The exact amount of HRC-X to be introduced will be determined based on the presence and levels of other electron acceptors in groundwater such as dissolved oxygen, nitrate, iron, manganese, and sulfate. Groundwater information and analytical data for these parameters will be collected prior to field application. HRC-X is anticipated to create even more favorable conditions for natural attenuation. Information regarding the HRC-X product and a generic spreadsheet used to determine an appropriate amount of product for introduction into the groundwater is provided in Appendix B. Additional information is also available at www.regenesis.com. HRC-X is a viscous liquid. To facilitate introduction into the subsurface through the existing wells it will be mixed with water to reduce its viscosity. The HRC-X mixture will be introduced to the wells using a GS200 grout pump (or equivalent).

The HRC-X will be introduced prior to decommissioning of the wells and placed within the upper portion (15 feet) of the aquifer. The HRC-X slurry will be placed in the deepest vapor monitoring points which are screened to within a few feet of the

groundwater surface and into the air sparge and air sparge detection monitoring wells prior to abandonment.

Aquifer parameters including dissolved oxygen (DO) and oxidation reduction potential (ORP) will be monitored before and after the placement of the HRC- X material to provide an indication of the affect of the HRC-X on groundwater conditions. Additional monitoring, evaluation, and other potential remedial aspects for this area will be included in the operations, maintenance, and monitoring plan for the Area 9/10 Remedial Design.

WELL ABANDONMENT

The existing wells in the OSA will be abandoned in accordance with the Illinois Water Well Construction Code Section 920.120 in preparation for the excavation activities. The soil vapor extraction, air sparge, vacuum monitoring, and air sparge monitoring wells or points with a depth greater than five feet will be properly abandoned by filling the well annulus with a cement bentonite slurry installed via tremie pipe to a depth of four feet bgs. The near ground surface portion of the well risers will be removed in connection with the OSA excavation activities. The shallow wells (five feet or less in depth) will be completely removed as part of the excavation activities.

WASTE CHARACTERIZATION

There is a waste characterization profile from previous investigation work in the OSA that is active and current. SECOR will confirm acceptance of the excavation waste material under the existing profile with the selected disposal facility or determine if additional characterization is required. If necessary, waste characterization samples will be collected and analyzed and submitted to the hazardous waste disposal facility for acceptance. The material will be manifested and shipped under characteristically hazardous waste code F002 or other as determined by the characterization analysis.

EXTENT OF EXCAVATION ACTIVITIES AND CONSTRAINTS

The extent of excavation will be the entire OSA area to the target depths identified. The excavation area is bounded immediately to the west by a public sidewalk and right of way which contains utilities, to the south by a local spur line of the Illinois Central Railroad, to the east by a grass and landscaped area, and to the north by an asphalt access road to the HS employee parking lot. Utilities locations are a concern with regard to the excavation work. The overhead electric line will be shielded, temporarily taken out of service, or moved to facilitate the excavation activities. The location of underground public utilities will be identified by a Joint Utilities Locate Identification for Excavators (JULIE) call and facility utilities will be identified by a private utility locate. The railroad will also identify if there are any underground signal lines in the vicinity.

There are two primary factors that will present constraints on the excavation activities:

- 1) Health and safety considerations – a potential exists of undermining utilities, sidewalk, roadways, and railroad tracks adjacent to the OSA endangering SECOR employees, subcontractors, HS employees, and the general public. The cohesiveness of the site soils, soil moisture content, and weather conditions at the time of excavation will all be factors in how complete excavation can be made up to the perimeter of the OSA.
- 2) Property boundary, existing right of way (public and railroad) and utility easements – the structural integrity of existing infrastructure (utilities, sidewalk, railroad tracks) must not be compromised. The HS property lines, identified site and public utilities, and surface infrastructure (sidewalk, roads, etc.) are shown on Figure 1.3.

To address these concerns the soil excavation may be sloped, benched, spot dug and backfilled, or temporary supporting structures (trench box or excavation shield) may be used to minimize the potential for: 1) excavation wall collapse, 2) potential undermining the stability of the excavation equipment, or 3) potential damage to public or private infrastructure (utilities, sidewalk, road, rail line). Additionally all contractors, surveyors,

SECOR personnel, and others working within the the railroad lease area will need to be registered with E-Railsafe.com. A qualified flag person will be required during all work within 25 feet of the railroad track.

EXCAVATION EQUIPMENT, LOADING, AND TRANSPORT

The excavation work will be completed using a track backhoe excavator (or equivalent). The concrete pad will be scored with a concrete saw and broken into manageable pieces using a backhoe as part of excavation activities. The concrete and impacted gravel will be disposed along with the waste material. The excavated soil will be loaded into lined container boxes with tarps or loaded directly into trucks with lined boxes with tarps. The trucks for transport will remain outside of the OSA. The material will be transported by truck to the designated facility.

HAZARDOUS WASTE DISPOSAL

The waste will be shipped to a HS approved hazardous waste disposal facility. HS has contractual agreements with a number of disposal facilities. Once final selection of the disposal facility is confirmed and the waste is accepted for shipment SECOR will provide this information to the USEPA and IEPA.

DECONTAMINATION

A temporary decontamination pad will be established in the HS paved area to the north of the OSA. A pad made with impermeable polyethylene sheeting will be placed on the asphalt and sloped for water collection. All excavation equipment will be decontaminated using a steam cleaner and/or pressure washing equipment. The decontamination water will be containerized and staged within the decontamination or exclusion zone. Upon project completion (or before as necessary) the wastewater will be characterized, transported offsite, and properly disposed at a HS approved facility. All soil from decontamination activities will be disposed along with the site soils.

Work-generated solid waste (used PPE, plastic sheeting, etc.) will be visually inspected. If inspection indicates the materials may be contaminated, it will be disposed along with the waste material. If no evidence of contamination is present, the materials will be double bagged (trash bags) and disposed in an onsite dumpster for ultimate disposal in a sanitary landfill.

EXCAVATION SAMPLING

Upon completion of excavation activities in a specific area, base and wall samples, as appropriate, will be collected. The soil samples will be obtained using the backhoe bucket or other sample collection device, as appropriate. Personnel will not enter the excavation for sampling activities at any location greater than four feet deep. Samples will be collected halfway up the sidewall whether vertical or sloped. Base and wall samples will be collected on approximately 20 feet intervals. At a minimum, three samples from each wall will be collected for a total of 12 wall samples around the perimeter of the OSA. Base samples will also be collected on approximately 20 feet centers. This is estimated to result in a total of nine base samples. The base samples will likely be at different depths below ground surface as the target excavation depths will vary. Representative wall and base sample locations are shown on Figure 3.2. Representative samples will be collected at locations based on the criteria in the following order: 1) safe sample collection, 2) location and depth of base or wall face area for that portion of the excavation, 3) visual or PID indication of impact. Actual sample locations will be based on the post-excavation dimensions.

Samples will be collected, packaged, and preserved in the same manner described in the approved Field Sampling Plan for drilling soil samples with the exception that these samples will be collected by other than drilling equipment. Two soil duplicate samples (1 per 20 samples) for Quality Assurance/Quality Control (QA/QC) are planned. The laboratory will run and report MS/MSD analyses on a 1 per 20 sample basis. No field sampling blanks will be collected. Trip blanks will accompany each shipment of samples sent for analysis. The samples will be submitted to STL Laboratories in University Park, Illinois for the target analyses (VOCs, TCLP metals). No TPH DRO analysis is

warranted as the comprehensive sampling completed as part of the Pre-Design Investigation in this area had no TPH DRO detections in any of the samples.

The samples will be identified using the following nomenclature which has been slightly modified from the Field Sampling Plan (FSP) protocol.

OSA - SR- MMY -W1

OSA - SR - MMY -B1

Whereas: OSA = Outside Storage Area

SR = Source Reduction

MM = Month

YY = Year

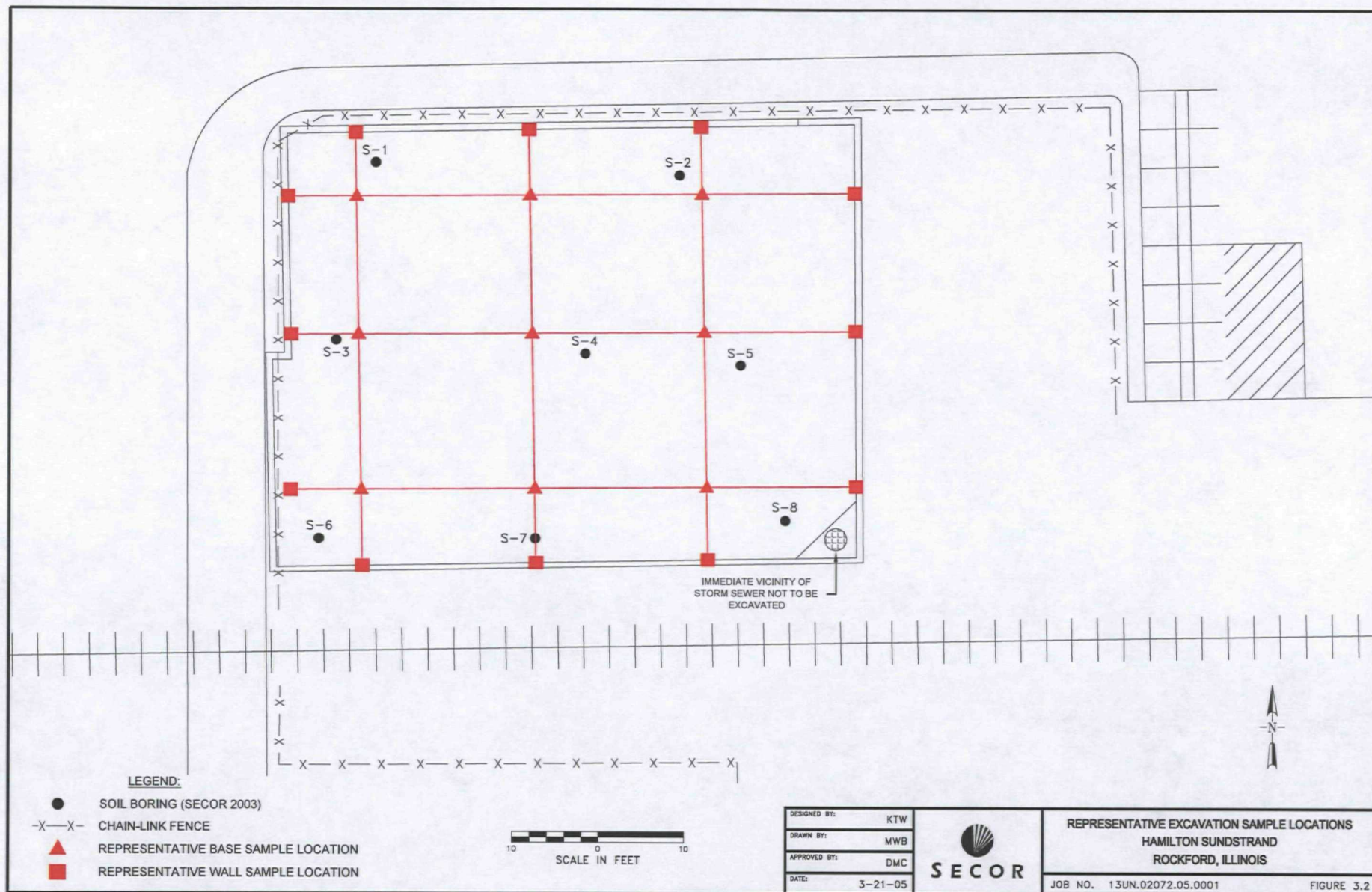
W = Wall Sample

B = Base Sample

1 = Sequential Numbers

Sample collection from the interior walls within the excavation area has been contemplated but in practice will not be possible as these interior walls will not necessary exist. The difference in depths between some of the excavation subareas (e.g., S-1 and S-5 versus the others) is approximately two feet. In the field, during the implementation of the excavation effort it is very likely that there will be an angled slope in the floor of the excavation as opposed to a sheer vertical wall in the vicinity of the depth changes. As a result potential interior walls sample locations would essentially be additional base samples.

The excavation base sample locations were selected on a grid basis (approximately 20 feet spacing) to supplement the existing and more comprehensive continuous interval soil sampling already completed. The base samples will include three locations within the subareas around S-1 and S-2 and another location by S-5. From the eight borings which were continuously sampled approximately, 110 sample data intervals will remain after excavation across the 65 feet by 50 feet area. This data, combined with the additional 21 wall and base samples planned, will provide a very high density of representative analytical data of the soil remaining within the OSA. Therefore sampling of the interior walls (if possible) is not anticipated.



EXCAVATION BACKFILLING

The timing and manner of backfill placement will be dictated by the actual site and soil conditions. If existing infrastructure or utilities are considered vulnerable, backfill placement will be completed immediately following the excavation and sampling activities. Shoring is not anticipated to be required. The excavation will be backfilled with clean fill material from a documented source. At a minimum, the top three feet of fill will be a clay soil. In the past, one or more feet of clean pea gravel was placed over the concrete pad and OSA area for aesthetic purposes. Some of this material may be used for deeper backfill as deemed appropriate.

CLAY CAP PLACEMENT

The clay cap will be installed to mimic the existing (relatively flat) grade. The top three feet of backfill material will be clean clay soil. The soil will be placed in one foot lifts over the excavated area and compacted with the excavating equipment. The area will then be top dressed with suitable topsoil and seeded with grass to minimize erosion and for aesthetic purposes. Additional erosion control is not anticipated to be required.

SECTION 4.0 DOCUMENTATION

After completion of the SMMRWP activities, a summary report documenting the work will be prepared. The report will consist of a brief narrative of the natural attenuation enhancement data collection and HRC-X introduction, well abandonment, excavation, and backfilling activities. The report will also include a figure identifying the actual boundary of the OSA excavation activities, a presentation of all analytical data in tabular format, a comparison of the analytical results with PRG/TACO ROs, well abandonment documentation, and a summary of all material transported on and offsite. The following provides additional description of several key portions of the report.

NATURAL ATTENUATION ENHANCEMENT

A summary of the activities completed to enhance the natural attenuation in the area will be provided including the field measurements and analytical results of groundwater electron acceptors, the amount of HRC-X supplied, the completed HRC-X calculation worksheet, and a narrative of the introduction method.

WELL ABANDONMENT

A narrative of the procedure and completed Illinois Department of Public Health water well abandonment forms will be provided.

EXCAVATION MASS REDUCTION ACTIVITY REPORTING

The actual excavation area in both areal extent and vertically by subarea will be documented. This will be correlated with the volume/weight of the material transported offsite under manifest. Copies of the waste manifests will be provided. The soil volume and contaminant concentrations previously documented will allow for an estimation of the mass reduction accomplished by this effort.

EXCAVATION SAMPLING ANALYSIS AND EVALUATION

The report will provide a summary of the excavation wall and base sample data and a comparison of those concentrations with the PRGs specified in the ROD, 35 IAC 742 TACO ROs, and ROs identified in the IEPA correspondence dated July 22, 2004.

EXCAVATION BACKFILL AND CLAY CAP CONSTRUCTION

The source(s), types, and volumes of backfill material will be documented and summarized. The manner of placement of the clay material and means of compaction will also be provided. A description of the steps taken to record the cap as an engineered barrier or a copy of the document recorded on the property deed restricting future development activities and protection of the cap will be provided.

PHOTOGRAPHIC DOCUMENTATION

Photographic documentation of the OSA prior to, during, and after completion of the activities in this work plan will be provided.

APPENDIX A

USEPA Approval Letter and Comment Response

- USEPA Letter Dated August 15, 2005
- SECOR Letter Response to USEPA and IEPA Comments
Dated June 28, 2005

USEPA LETTER DATED AUGUST 15, 2005

RECEIVED

United States Environmental Protection Agency
Region 5
77 West Jackson Boulevard
Chicago, Illinois 60604

AUG 17 2005

August 15, 2005

Mr. David M. Curnock
SECOR International Incorporated
446 Eisenhower Lane North
Lombard, Illinois 60148

Re: Outside Storage Container Area - Source Area 9/10
Southeast Rockford Groundwater Contamination Site

Dear Mr. Curnock:

The United States Environmental Protection Agency (U.S. EPA) is in receipt of materials prepared June 28, 2005 by your firm. The June 28 document provided response to comments developed by U.S. EPA and the IL EPA with regard to the Outside Storage Container Area (OSA) Source Material Mass Reduction Work Plan.

U.S. EPA understands that the means of contaminant mass reduction proposed for the OSA is to employ excavation so as to remove most of the contaminated soil. Within the OSA, the majority of soil contaminants appear to be located within the first 4-6' of soil depth, unlike other portions of Source Area 9/10 where contaminants are found at deeper locations. Contaminated soils thus excavated would undergo off-site shipment to a suitable disposal facility.

U.S. EPA understands that the soil vapor extraction and air sparging technologies selected in the June 11, 2002 Record of Decision for Operable Unit #3 would be employed elsewhere at Source Area 9/10 beyond the OSA.

U.S. EPA further understands that two other important aspects of proposed OSA Mass Reduction work are: 1.) Usage of a groundwater additive which would tend to promote anaerobic conditions in nearby aquifer regions, thereby in theory facilitating microbial biodegradation of chlorinated species in groundwater, which constitute most of the groundwater contaminants of concern; and, 2.) Backfilling excavated OSA areas after removal of contaminated soils, making use of clean soils and/or gravel for fill materials, and placing a simple cap - such as of clay or asphalt - over the backfilled area. This would be done as a means of assuring site user safety and minimizing subsequent water infiltration into the previously excavated area.

Upon review of the work plan comment responses as noted in the June 28, 2005 document, and after opportunity to confer with IL EPA, U.S. EPA approves of the work plan as modified by the responses to agencies comments subject to the following conditions:

- Air monitoring discussion in the comment responses appears satisfactory. However, contingency shall be made, if necessary, for the occurrence of encountering unusually high or threatening ambient vapor levels. Since Source Area 9/10 is in a significant industrial area, air monitoring performed to ensure site user, worker, and nearby personnel safety may need to be set up so as to verify that any emissions of concern are related to OSA excavation work. A list of possible corrective actions or contingencies should be noted in the work plan. U.S. EPA suggests that the presence of atmospheric volatile emissions in excess of 1 ppm above background at the property boundary due to OSA-related work may be reason to consult contingency portions of the work plan. Such contingency could consist of work schedule alteration, and/or employment of vapor-suppressing foams, as the circumstances may dictate.

- U.S. EPA be given opportunity to review proposed locations, and means of materials and installation techniques used for new proposed groundwater monitoring wells which would be used to help gauge the effectiveness of the pilot program of groundwater additives employed for enhanced biodegradation of main aquifer contaminants.

- U.S. EPA be given opportunity to receive, as a remedial design deliverable document, sampling results from any newly installed groundwater monitoring wells as discussed in the previous condition. Likewise, as confirmation soil sampling results become available to check on degree of contaminant removal after excavation performance, these results are to be provided to U.S. EPA and IL EPA for review consideration.

- That within 15 business days time of cap installation over the excavated/backfilled OSA area, SECOR's client in this matter, Hamilton Sundstrand, shall initiate necessary steps to place on site property deed restrictions or restrictive covenants, giving due notice of the cap's existence, such that the cap is adequately protected from undue harm by future site usage or development. For example, the cap should be protected from utility line installation or repair. U.S. EPA shall receive notice of the filing of any pertinent deed restrictions or restrictive covenants involving said cap.

- SECOR and Hamilton Sundstrand understand that U.S. EPA, working in cooperation with IL EPA, needs to place a revised (final) version of the work plan into the site's information repository and Administrative Record. Hence, a proposed final work plan indicating remedial objectives are based on June 11, 2002 Record of Decision cleanup criteria for Source Area 9/10 (not TACO) should be generated and sent to U.S. EPA and IL EPA.

Thank you for your attention to these items. This constitutes work plan approval with modifications noted. However, SECOR and Hamilton Sundstrand should understand that actual field work performance - other than initiation of advisable monitoring checkpoints and access

permission arrangements - should not be conducted until after Source Area 9/10 Outside Storage Container Area Explanation of Significant Differences (ESD) signature. U.S. EPA will advise you of progress regarding the ESD.

Yours truly,



Russell D. Hart, RPM

cc:

T. Turner, ORC

T. Williams, IL EPA

**SECOR LETTER RESPONSE TO USEPA AND IEPA COMMENTS
DATED JUNE 28, 2005**



SECOR
INTERNATIONAL
INCORPORATED

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Lombard, IL 60148
630-792-1680 TEL
630-792-1691 FAX

June 28, 2005

Mr. Russell Hart
United States Environmental Protection Agency
Region V
77 West Jackson Boulevard
Chicago, Illinois 60604-3590

RE: OSA Source Material Mass Reduction Work Plan Comment Response
Area 9/10, Remedial Design
Southeast Rockford Groundwater Contamination Superfund Site
Rockford, Illinois

Dear Mr. Hart:

As a follow-up to our recent meeting and discussion, on behalf of Hamilton Sundstrand (HS), SECOR International Incorporated (SECOR) is providing a response to comments received from United States Environmental Protection Agency (USEPA) and the Illinois Environmental Protection Agency (IEPA) regarding the Outside Storage Container Area (OSA) Source Material Mass Reduction Work Plan (the Plan). The USEPA comments were contained in an electronic-mail message from Mr. Russell Hart to Mr. David Curnock, SECOR, dated May 3, 2005. IEPA comments were submitted to the USEPA in a letter dated May 13, 2005 and subsequently forwarded on to SECOR by the USEPA in correspondence dated May 23, 2005. Copies of both USEPA and IEPA comment correspondence are attached to this letter as reference. The format of this response letter presents the Agency comment followed by the HS/SECOR response.

USEPA OSA REVIEW DATED MAY 3, 2005

1) Comment:

"What provisions are to be made for air monitoring at the OSA perimeter such that assurance is provided that day-to-day Hamilton Sundstrand and other plant visitors are not adversely impacted by VOC vapor levels that could be related to excavation work conducted within the OSA? It would seem appropriate to have such monitoring capability in order to cease operations if necessary if VOC levels became too high. This reasoning would apply to adequate protection of nearby off-site personnel (residential areas, nearby shops, places of commerce, etc.)."

Response:

Ambient and personal breathing space air monitoring will be undertaken as part of this effort. The site specific health and safety plan for the continuing work at this facility will be amended to incorporate the excavation activities. Air monitoring using an 11.7 eV photoionization detector (or equivalent) will be implemented within the work zone and periodically at the work zone perimeter. Threshold levels will be established for worker upgrades in level of personnel protective equipment (PPE) and for cessation or modification of work practices if certain trigger values are reached in the perimeter monitoring program.

Mr. Russell Hart
RE: Response to Comments
June 28, 2005
Page 2

2) Comment:

"Introduction of the Hydrogen Release Compound – This procedure may have interest as a pilot application, but I think it may be premature to consider this a means of control for potential low-grade future groundwater sources for any significant portion of the overall plume or groundwater management zone. If I understand the proposed work plan correctly, certain existing monitoring wells within the OSA where excavation may proceed are to be dismantled and abandoned in accordance with IL EPA procedures on this subject. Then, after excavation the hydrogen releasing compound is to be introduced via slurry/solution injection. What wells are to be established to verify that the compound is indeed having a positive effect on VOC levels? Lacking such wells, it would seem difficult/impossible to be able to make a determination about the specific results using this compound. If one of the features of this compound is to enhance anaerobic conditions as opposed to aerobic conditions in groundwater, what monitoring, either of oxygen levels, populations of aerobic/ anaerobic microbes will occur to help relate "cause and effect" associations that may be related to changes in VOC levels in groundwater after application? I appreciate that this technique may serve as a secondary means of source control, and may provide reassurance especially to State RCRA reviewers if excavation alone does not fully attain soil clean-up goals within the OSA. However, I would think that regulatory agency personnel would want to know some verifiable means of knowing what area/depth this slurry injection is affecting."

Response:

The introduction of the hydrogen release compound (HRC-X) is being proposed based on the "opportunity" presented by having the pilot study monitoring points in place at this time. The HRC-X would be introduced prior to decommissioning of the wells. The hydrogen release compound – extended release formula (HRC-X) will be placed within the upper portion (15 feet) of the aquifer. The HRC-X slurry will be placed in the deepest vapor monitoring points which are screened to within a few feet of the groundwater surface and into the air sparge and air sparge detection monitoring wells prior to abandonment. Aquifer parameters including dissolve oxygen (DO) and oxidation reduction potential (ORP) will be monitored before and after the placement of the HRC- X material to provide some indication of the affect that HRC-X would have on the groundwater conditions. Additional monitoring, evaluation, and other potential remedial aspects for this area would be integrated into the overall Remedial Design for Area 9/10 which has yet to be developed.

3) Comment:

"The work plan divides the OSA zone into 8 subportions, based on soil boring results. For 6 of these 8 zones, it is projected that excavation to a depth of 4 feet will be adequate to attain – if not "final" soil cleanup goals, then at least sufficient mass removal to justify excavation cessation provided that some capping and/or material limiting further movement of contaminant mass into groundwater is applied. For 2 of the 8 zones, it is projected that excavation to 6 feet will be necessary. Soil constituent content after

Mr. Russell Hart
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June 28, 2005
Page 3

excavation is depicted in Table 2.2. Figure 3.2 depicts points showing "representative base sample location" and "representative wall sample location". In looking at the suggested wall sample locations, it appears that while the perimeter of the overall OSA area would get adequate sample coverage to verify reaching/satisfactorily approaching desired soil cleanup values, I am not so sure about the interior of the OSA zone. Shouldn't there be some verification sampling to go along with the inner walls of the eight zones for which soil borings were performed? This would seem especially important for the zones for which contaminant soil levels were quite high - zones S-1 and S-2 - and also for the zones where excavation is projected to be needed to go to the 6' depth level - in this case zones S-1 and S-5."

Response:

The aspect of the additional sample collection from the interior walls within the excavation area is understood in theory, however, in practice it may not be possible as these interior walls will not necessarily exist. The difference in depths between some of the excavation subareas (e.g., S-1 and S-5 versus the others) is approximately two feet. In the field implementation of the excavation effort it is very likely that there will be an angled slope in the floor of the excavation as opposed to a sheer vertical wall in the vicinity of the depth changes. As a result the interior walls, sample locations would essentially be additional base samples.

The excavation base samples planned were selected on a grid basis (approximately 20 feet spacing) to supplement the existing and more comprehensive continuous interval soil sampling already completed. The base samples planned will include three locations within the subareas around S-1 and S-2 and another location by S-5. From the eight borings which were continuously sampled approximately, 110 sample data intervals will remain after excavation across the 50 feet by 65 feet area. This data, combined with the 21 wall and base samples planned, is anticipated to provide representative analytical data of the soil remaining within the OSA. Additional sampling of the interior walls (if practical) would provide limited additional information as the data density in this area is already very high.

IEPA LETTER DATED MAY 13, 2005

1) Comment:

"Illinois EPA is recommending that UTC/HS take necessary precautions as best that can be expected on groundwater monitoring wells to prevent unauthorized entry."

Response:

Agreed.

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RE: Response to Comments
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Page 4

2) Comment:

"The use of Illinois Administration Code 35 IAC Part 742 in reference to remediation objectives is inappropriate. The Tiered Approach to Corrective Objectives part 742 is not an ARAR for the Southeast Rockford Groundwater Contamination Site (SERGC). The applicable ARAR for this situation is 35 Ill. Adm. Code Part 620.410, therefore, any references of use of 35 Ill. Adm. Code Part 742 is as a screening tool only. All remediation objectives for the site including Source Area 9/10 are stated in the ROD for the SERGC signed in 2002."

Response:

The references to Tiered Approach to Corrective Action Objectives (TACO) 35 IAC 742 were for comparison purposes only. HS/SECOR are aware that the Preliminary Remediation Goals for Area 9/10 are prescribed in the Record of Decision (ROD) dated May 2002. Although not listed as an ARAR, the predecessor guidance to this regulation (35 IAC 742) was used in the derivation of the Preliminary Remediation Goals. With respect to the constituents of concern and the soil objectives to be applied, the Preliminary Remediation Goals in the ROD and the TACO remediation objectives are the same.

The OSA is a former RCRA unit which is subject to 35 IAC 725 regulations in addition to the conditions of the ROD. To address the overall environmental issues at the site including the ROD (which included Preliminary Remediation Goals) and RCRA responsibilities, a simplified comparison 35 IAC 742 was made. This was done for two reasons: 1) the constituents of concern in the OSA listed in the Preliminary Remediation Goals are the same as the TACO Tier I remediation objectives and derived by the same means, and 2) there are other constituents present at the OSA which are regulated under RCRA which are not part of the ROD but have specified remediation objectives in TACO.

The remedial objectives for constituents regulated under RCRA are subject to 35 IAC 742 TACO. Also, while the site groundwater is subject to 35 IAC 620 regulations, these are groundwater quality regulations only and do not address constituent concentrations in soil.

3) Comment:

"In addition to Ill. Adm. Code Part 620, UTC/HS needs to comply with the ARAR, Ill. Adm. Code Part 724 in use of Remediation Objectives and final closure requirements for the former OSA unit. This is specifically directed to UTC/HS in a letter dated October 15, 2002 with specific requirements listed in Attachment A of the letter. The submitted work plan to remove source material will definitely assist in achieving the post closure requirements, however, it will not complete them pursuant to Ill. Adm. Code Part 724 Subparts F (Releases from Solid Waste Management Units) and G Post (Closure and Post-Closure) requirements."

Mr. Russell Hart
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Response:

Final closure of the OSA is not being sought at this time. In the appendix of the letter dated October 15, 2002, it is stated that the site is subject to 35 IAC 725 interim status regulations. At the appropriate time, the request for final closure will address those requirements in 35 IAC 725.

4) Comment:

"Future work plan submittals need to make note of specific requirements of comments 2 and 3 and how these specific ARARS and outstanding RCRA issues will be met."

Response:

Future work plans will address appropriate remediation goals or objectives and how the planned activities address issues with respect to RCRA.

5) Comment:

"Use of Ill. Adm. Code Part 742.225(c) that states, continuous interval soil samples were averaged at each boring location. Illinois EPA realizes that this was done in an effort to help facilitate mass reduction of hazardous materials through excavation. This assumption however, to average soil samples with VOCs exceeding the soil saturation limits indicates that the soil may exceed Ill. Adm. Code 721.123, therefore, averaging soil sample results may not be appropriate pursuant to CERCLA and the NCP as opposed to comparison of discrete sample results for analysis."

Response:

The averaging of concentrations from continuously sampled soil intervals was used to determine and estimate the mass of constituents and evaluate the benefit of excavation and off-site disposal on a per lift basis. Upon review of the sample analytical data, at this time it does not appear that the two sample intervals where the soil saturation limit was exceeded will present an issue with respect to reactivity per 35 IAC 721.123.

6) Comment:

"After the excavation is completed remaining levels in soil of metals and VOCs shall be compared to Remediation Objectives in the ROD for review. The potential effectiveness of the proposed RA work is premature at this point until Illinois EPA and U.S. EPA have evaluated a submitted design."

Response:

As noted in comment number 2, the ROD does not provide preliminary remediation goals for the metals of potential concern in the OSA (lead and cadmium). HS will compare the

Mr. Russell Hart
RE: Response to Comments
June 28, 2005
Page 6

existing data and post excavation base and wall soil analytical data with the appropriate remediation objectives. HS agrees that a determination of the potential effectiveness of the source material reduction work is premature. HS plans to incorporate additional monitoring, evaluation, and any potential remedial actions for the OSA into the Remedial Design for Area 9/10.

7) Comment:

"The proposed procedure to enhance natural attenuation may require UTC/HS to expand the parameters of the groundwater sampling to determine if anaerobic conditions are being created. Groundwater monitoring wells will need to be placed in such a manner as to verify the effectiveness of this procedure for long and short-term evaluation. Illinois EPA does have the intention of installing down-gradient groundwater monitoring wells as part of monitoring natural attenuation and monitoring the effectiveness of all RA work in Area 9/10."

Response:

HS plans to monitor dissolved oxygen (DO) and oxidation reduction potential (ORP) in the wells within the OSA prior to and after the placement of the hydrogen release compound extended release (HRC-X) material for short term evaluation. Additional groundwater monitoring wells would assist in this effort. Long term efforts by HS will be incorporated into the Remedial Design for Area 9/10.

8) Comment:

"Copies of well abandonment reports should also be forwarded to Illinois EPA as well as the other appropriate State Agencies."

Response:

Copies of the well abandonment forms will be provided to IEPA as part of the documentation of the work plan activities as outlined in Section 4.0 of the Plan. The forms will also be submitted to other appropriate State Agencies, including the Illinois Department of Public Health as required.

9) Comment:

"Waste disposal needs to meet the requirements set forth in the ROD as well as meeting Federal and State of Illinois requirements. Illinois EPA NPL unit and U.S. EPA should receive copies of waste disposal manifests and other appropriate documentation."

Mr. Russell Hart
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Response:

The waste disposal planned will meet the requirements set forth in the ROD, as well as all other State and Federal requirements. As indicated in Section 4.0, copies of the waste disposal manifest will be submitted as part of the documentation of the work plan activities.

10) Comment:

"A corrected copy of this work plan will be required for placement into the repositories that in particular addresses comments 2 and 3."

Response:

This response is intended to serve as an addendum to the work plan and a means to address and clarify the issues raised in comments 2 and 3.

11) Comment:

"If UTC/HS is going to rely on sample collection in the excavated area as verification of removal, other potential sampling may be necessary to verify what contaminant concentrations actually. During the excavation process UTC/HS will need to perform air monitoring to minimize exposure risk from inhalation of VOCs."

Response:

The planned excavation wall and base samples (21 samples total) combined with the continuous soil sampling effort already completed (continuously on two feet intervals from four feet or six feet to 32 feet at eight locations - 110 samples) appear to be adequate to determine what constituent concentrations remain in the OSA, as well as what is to be removed. Air monitoring will be performed during the excavation activities (also, see USEPA comment 1).

12) Comment:

"The placement of a clay cap of three feet is satisfactory for short-term acceptance, however, if contaminants of concern (COCs) are to be left in place. This cap and the materials from which it is constructed may need to be reevaluated for the long-term remedy. Metals left behind that exceed Remediation Objectives (ROs) in the ROD may require a cap that will stop infiltration of precipitation sufficiently to meet the requirements of Ill. Adm. Code Part 620."

Mr. Russell Hart
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June 28, 2005
Page 8

Response:

Placement of the clay cap at the OSA is a positive interim measure that will minimize infiltration. The presence of the clay cap and the suitability of the materials of construction will be evaluated as part of the final remedial design activities.

13) Comment:

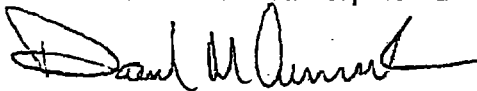
"If COCs that exceed ROs are to remain in place, institutional controls will be necessary."

Response:

Institutional controls will be considered as part the final remedial design.

We appreciate the USEPA's and IEPA's cooperation and involvement in keeping the Area 9/10 Remedial Design effort moving on an appropriate course. As always, if you have any questions, please do not hesitate to call.

Sincerely,
SECOR International Incorporated



David M. Curnock
Principal Scientist

attachments: May 3, 2005 Electronic Mail to SECOR from USEPA
May 13, 2005 Letter to USEPA from IEPA

cc: Mr. Scott Moyer, HS/UTC
Ms. Kathleen McFadden, UTC
Mr. Brian Yeich, UTC
Mr. Thomas Turner, USEPA
Mr. Thomas Williams, IEPA
Mr. Terry Ayers, IEPA

ATTACHMENT

May 3, 2005 Electronic Mail to SECOR from USEPA

and

May 13, 2005 Letter to USEPA from IEPA

RUSSELL
HART/R5/USEPA/JS
05/03/2005 11:44 AM

To
Subject Area 9/10 - Review - Outside Container Storage Area - Mass
Reduction Work Plan

Dear Mr. Cumock - I have received a copy of the above-noted document, dated April 27, 2005. (I look forward to also receiving overall Area 9/10 conceptual design information, and horizontal drilling proposals). In reviewing the OSA Source Material Mass Reduction Work Plan, I have three main areas of comment:

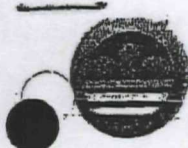
1.) What provisions are to be made for air monitoring at the OSA perimeter such that assurance is provided that day-to-day Hamilton Sundstrand and other plant visitors are not adversely impacted by VOC vapor levels that could be related to excavation work conducted within the OSA? It would seem appropriate to have such monitoring capability in order to cease operations if necessary if VOC levels became too high. This reasoning would apply to adequate protection of nearby off-site personnel (residential areas, nearby shops, places of commerce, etc.).

2.) Introduction of the Hydrogen Release Compound - This procedure may have interest as a pilot application, but I think it may be premature to consider this a means of control for potential low-grade future groundwater sources for any significant portion of the overall plume or groundwater management zone. If I understand the proposed work plan correctly, certain existing monitoring wells within the OSA where excavation may proceed are to be dismantled and abandoned in accordance with IL EPA procedures on this subject. Then, after excavation the hydrogen releasing compound is to be introduced via slurry/solution injection. What wells are to be established to verify that the compound is indeed having a positive effect on VOC levels? Lacking such wells, it would seem difficult/impossible to be able to make a determination about the specific results using this compound. If one of the features of this compound is to enhance anaerobic conditions as opposed to aerobic conditions in groundwater, what monitoring, either of oxygen levels, populations of aerobic/anaerobic microbes will occur to help relate "cause and effect" associations that may be related to changes in VOC levels in groundwater after application? I appreciate that this technique may serve as a secondary means of source control, and may provide reassurance especially to State RCRA reviewers if excavation alone does not fully attain soil clean-up goals within the OSA. However, I would think that regulatory agency personnel would want to know some verifiable means of knowing what area/depth this slurry injection is affecting.

3.) The work plan divides the OSA zone into 8 subportions, based on soil boring results. For 6 of these 8 zones, it is projected that excavation to a depth of 4 feet will be adequate to attain - if not "final" soil cleanup goals, then at least sufficient mass removal to justify excavation cessation provided that some capping and/or material limiting further movement of contaminant mass into groundwater is applied. For 2 of the 8 zones, it is projected that excavation to 6 feet will be necessary. Soil constituent content after excavation is depicted in Table 2.2. Figure 3.2 depicts points showing "representative base sample location" and "representative wall sample location". In looking at the suggested wall sample locations, it appears that while the perimeter of the overall OSA area would get adequate sample coverage to verify reaching/satisfactorily approaching desired soil cleanup values, I am not so sure about the interior of the OSA zone. Shouldn't there be some verification sampling to go along with the inner walls of the eight zones for which soil borings were performed? This would seem especially important for the zones for which contaminant soil levels were quite high - zones S-1 and S-2 - and also for the zones where excavation is projected to be needed to go to the 6' depth level - in this case zones S-1 and S-5.

I look forward to discussing these comments with you and IL EPA, and to your response.

Russ Hart



ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

1021 NORTH GRAND AVENUE EAST, P.O. BOX 19276, SPRINGFIELD, ILLINOIS 62794-9276, 217-782-3397

JAMES R. THOMPSON CENTER, 100 WEST RANDOLPH, SUITE 11-300, CHICAGO, IL 60601, 312-814-6026

ROD R. BLAGOJEVICH, GOVERNOR

RENEE CIPRIANO, DIRECTOR

RECEIVED

815-223-1714

MAY 31 2005

May 13, 2005

7002 2030 0001 1873 9122

Mr. Russ Hart Remedial Project Manager SR-6J
United States Environmental Protection Agency
Region V
77 W. Jackson Blvd.
Chicago, Illinois 60604-3590

Refer to: 2010300074—Winnebago County
Southeast Rock Groundwater Contamination Site
Superfund/Technical Reports

Dear Mr. Hart

The Illinois Environmental Protection Agency (Illinois EPA) has reviewed the document entitled Outside Storage Area Source Material Mass Reduction Work Plan (Report) dated April 27, 2005. SECOR International Incorporated of Lombard prepared the Report on the behalf of United Technologies Hamilton Sundstrand (UTC/HS). The work plan was prepared in as part of the requirements of the Administrative Order on Consent (AOC) between the US EPA and UTC/HS dated January 13, 2003. Illinois EPA approves of the Report/Work Plan using excavation to reduce the source material below the former OSA unit. UTC/HS should address the comments below to the Report and incorporate the appropriate changes the Remedial Design Work Plan.

1. Illinois EPA is recommending that UTC/HS take necessary precautions as best that can be expected on groundwater monitoring wells to prevent unauthorized entry.
2. The use of Illinois Administration Code 35 IAC Part 742 in reference to remediation objectives is inappropriate. The Tiered Approach to Corrective Objectives Part 742 is not an ARAR for the Southeast Rockford Groundwater Contamination Site (SERGC). The applicable ARAR for this situation is 35 Ill. Adm. Code Part 620.410, therefore, any references of use of 35 Ill. Adm. Code Part 742 is as a screening tool only. All remediation objectives for the site including Source Area 9/10 are stated in the ROD for the SERGC signed in 2002.

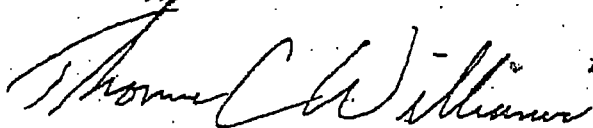
ROCKFORD - 4302 North Main Street, Rockford, IL 61103 - (815) 987-7760 • DES PLAINES - 9511 W. Harrison St., Des Plaines, IL 60016 - (847) 294-4000
ELGIN - 595 South State, Elgin, IL 60123 - (847) 608-3131 • PEORIA - 5415 N. University St., Peoria, IL 61614 - (309) 693-5463
BUREAU OF LAND - PEORIA - 7620 N. University St., Peoria, IL 61614 - (309) 693-5462 • CHAMPAIGN - 2125 South First Street, Champaign, IL 61820 - (217) 278-5800
SPRINGFIELD - 4500 S. Sixth Street Rd., Springfield, IL 62706 - (217) 786-6892 • COLLINSVILLE - 2009 Mall Street, Collinsville, IL 62234 - (618) 346-5120
MARION - 2309 W. Main St., Suite 116, Marion, IL 62959 - (618) 993-7200

3. In addition to Ill. Adm. Code Part 620, UTC/HS needs to comply with the ARAR, Ill. Adm. Code Part 724 in use of Remediation Objectives and final closure requirements for the former OSA unit. This is specifically directed to UTC/HS in a letter dated October 15, 2002 with specific requirements listed in Attachment A of the letter. The submitted work plan to remove source material will definitely assist in achieving the post closure requirements, however, it will not complete them pursuant to Ill. Adm. Code Part 724 Subparts F (Releases from Solid Waste Management Units) and G Post (Closure and Post-Closure) requirements.
4. Future work plan submittals need to make note of specific requirements of comments 2 and 3 and how these specific ARARS and outstanding RCRA issues will be met.
5. Use of Ill. Adm. Code Part 742.225(c) that states, continuous interval soil samples were averaged at each boring location. Illinois EPA realizes that this was done in an effort to help facilitate mass reduction of hazardous materials through excavation. This assumption However, to average soil samples with VOC's exceeding the soil saturation limits indicates that the soil may exceed Ill. Adm. Code 721.123, therefore, averaging soil sample results may not be appropriate pursuant to CERCLA and the NCP as opposed to comparison of discrete sample results for analysis.
6. After the excavation is completed remaining levels in soil of metals and VOCs shall be compared to Remediation Objectives in the ROD for review. The potential effectiveness of the proposed RA work is premature at this point until Illinois EPA and U.S. EPA have evaluated a submitted design.
7. The proposed procedure to enhance natural attenuation may require UTC/HS to expand the parameters of the groundwater sampling to determine if anaerobic conditions are being created. Groundwater monitoring wells will need to be placed in such a manner as to verify the effectiveness of this procedure for long and short-term evaluation. Illinois EPA does have the intention of installing down-gradient groundwater monitoring wells as part of monitoring natural attenuation and monitoring the effectiveness of all RA work in Area 9/10.
8. Copies of well abandonment reports should also be forwarded to Illinois EPA as well as the other appropriate State Agencies.
9. Waste disposal needs to meet the requirements set forth in the ROD as well as meeting Federal and State of Illinois requirements. Illinois EPA NPL unit and U.S. EPA should receive copies of waste disposal manifests and other appropriate documentation.
10. A corrected copy of this work plan will be required for placement into the repositories that in particular addresses comments 2 and 3.

11. If UTC/HS is going to rely on sample collection in the excavated area as verification of removal, other potential sampling may be necessary to verify what contaminant concentrations actually. During the excavation process UTC/HS will need to perform air monitoring to minimize exposure risk form inhalation of VOCs.
12. The placement of a clay cap of three feet is satisfactory for short-term acceptance, however, if contaminants of concern (COCs) are to be left in place. This cap and the materials from which it is constructed may need to be reevaluated for the long-term remedy. Metals left behind that exceed Remediation Objectives (RO's) in the ROD may require a cap that will stop infiltration of precipitation sufficiently to meet the requirements of Ill. Adm. Code Part 620.
13. If COC's that exceed RO's are to remain in place, institutional controls will be necessary.

Please provide the Illinois EPA with 3 copies of any future information submitted regarding the above referenced site. Mail two copies to the Springfield Illinois address and another copy to Thomas C. Williams LPG Illinois EPA Project Manager at PO. Box 1515 LaSalle, Illinois 61301-3515. The Illinois EPA requests 14 days notification of all site investigations and remedial activities to coordinate oversight. If you have any questions, please fell free to contact me at the telephone number 815-223-1714 or Terry Ayers at 217-524-3300.

Sincerely,



Thomas C. Williams LPG.
National Priorities List Unit
Federal Sites Remediation Section
Division of Remediation Management
Bureau of Land

cc: Bureau of Land File
Terry Ayers
Paul Jagiello DLC Des Plaines Regional Office
Virginia Forrer

APPENDIX B

**OSA Soil Investigation Analytical Results
October 2003 Summary Tables**

Appendix B
SOIL ANALYTICAL RESULTS – OUTSIDE CONTAINER STORAGE AREA (OSA)
(S1-S8) – VOCs, DRO/JP-4, and RCRA METALS
AREA 9/10
SER GROUNDWATER CONTAMINATION SUPERFUND SITE
ROCKFORD, IL
S1

SECOR

Analyte	ROD - Preliminary Remediation Goals and/or Section 742. Table A: Tier 1 Soil Remediation Objectives for Residential Properties				Location Depth Sample Date		SB-S1 2-4'	SB-S1 4-6'	SB-S1 6-8'	SB-S1 8-10'	SB-S1 10-12'	SB-S1 12-14'	SB-S1 14-16'	SB-S1 16-18'	SB-S1 18-20'	SB-S1 20-22'	SB-S1 22-24'	SB-S1 24-26'	SB-S1 26-28'	SB-S1 28-30'	SB-S1 30-32'	SB-S1 32-34'																		
	Soil Ingestion (ug/kg)	Soil Inhalation (ug/kg)	Soil Component of Groundwater Class 1 (ug/kg)	ADL (ug/kg)	Units	RES	Q	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg																		
1,1,1-Trichloroethane	NL	1,200,000	2,000	--			220,000	H	140,000		760		83		31		57		65		83		120		410		13		82		11		23		17		8.5			
1,1,2,2-Tetrachloroethane	NL	NL	NL	NL			440	U	410	U	90	U	5.1	U	5.1	U	4.7	U	4.8	U	9.4	U	7.2	U	5.1	U	5.6	U	4.9	U	5.3	U	5.3	U	5.2	U	5.4	U		
1,1,2-Trichloroethane	310,000	1,800,000	20	--			440	U	410	U	90	U	5.1	U	5.1	U	4.7	U	4.8	U	9.4	U	7.2	U	5.1	U	5.6	U	4.9	U	5.3	U	5.3	U	5.2	U	5.4	U		
1,1-Dichloroethane	7,800,000	1,300,000	23,000	--			7,600		11,000		230		5.1	U	4	Ja	11		8.2		7.2	Ja	17		120		5.6	U	15		5.3	U	5.3	U	5.2	U	5.4	U		
1,1-Dichloroethene	700,000	1,500,000	60	--			440	U	580		90	U	5.1	U	5.1	U	4.7	U	4.8	U	9.4	U	7.2	U	5.1	U	5.6	U	4.9	U	5.3	U	5.3	U	5.2	U	5.4	U		
1,2-Dichloroethane	7,000	400	20	--			440	U	410	U	90	U	5.1	U	5.1	U	4.7	U	4.8	U	9.4	U	7.2	U	5.1	U	5.6	U	7.2		5.3	U	5.3	U	5.2	U	5.4	U		
1,2-Dichloroethene (total)	NL	NL	NL	NL			12,000		9,400		280		19		6.1		14		12		11		24		130		5.6	U	22		5.3	U	4.5	Ja	3.5	Ja	5.4	U		
1,2-Dichloropropane	9,000	15,000	30	--			440	U	410	U	90	U	5.1	U	5.1	U	4.7	U	4.8	U	9.4	U	7.2	U	5.1	U	5.6	U	4.9	U	5.3	U	5.3	U	5.2	U	5.4	U		
2-Butanone (MEK)	NL	NL	NL	NL			440	U	410	U	90	U	5.1	U	5.1	U	4.7	U	4.8	U	9.4	U	7.2	U	5.1	U	5.6	U	4.9	U	5.3	U	5.3	U	5.2	U	5.4	U		
2-Hexanone	NL	NL	NL	NL			440	U	410	U	90	U	5.1	U	5.1	U	32		4.8	U	9.4	U	7.2	U	5.1	U	5.6	U	4.9	U	5.3	U	5.3	U	5.2	U	5.4	U		
4-Methyl-2-pentanone (MIBK)	NL	NL	NL	NL			440	U	410	U	90	U	5.1	U	5.1	U	4.7	U	4.8	U	9.4	U	7.2	U	5.1	U	5.6	U	4.9	U	5.3	U	5.3	U	5.2	U	5.4	U		
Acetone	7,800,000	100,000,000	16,000	--			440	U	410	U	90	U	5.1	U	5.1	U	18		4.8	U	13		10	M	5.1	U	5.6	U	9.2		6.8	M	5.3	U	18		12			
Benzene	12,000	800	30	--			110	U	100	U	22	U	5.1	U	5.1	U	4.7	U	4.8	U	9.4	U	7.2	U	4.7	Ja	5.6	U	4.9	U	5.3	U	5.3	U	2.8	Ja	5.4	U		
Bromodichloromethane	10,000	3,000,000	600	--			440	U	410	U	90	U	5.1	U	5.1	U	4.7	U	4.8	U	9.4	U	7.2	U	21		5.6	U	4.9	U	5.3	U	5.3	U	5.2	U	5.4	U		
Bromoform	81,000	53,000	800	--			440	U	410	U	90	U	5.1	U	5.1	U	4.7	U	4.8	U	9.4	U	7.2	U	5.1	U	5.6	U	4.9	U	5.3	U	5.3	U	5.2	U	5.4	U		
Bromomethane	110,000	10,000	200	--			440	U	410	U	90	U	5.1	U	5.1	U	4.7	U	4.8	U	9.4	U	7.2	U	5.1	U	5.6	U	4.9	U	5.3	U	5.3	U	5.2	U	5.4	U		
Carbon disulfide	7,800,000	720,000	32,000	--			440	U	410	U	90	U	5.1	U	5.1	U	4.7	U	4.8	U	9.4	U	7.2	U	5.1	U	5.6	U	4.9	U	5.3	U	5.3	U	5.2	U	5.4	U		
Carbon tetrachloride	5,000	300	70	--			440	U	410	U	90	U	5.1	U	5.1	U	4.7	U	4.8	U	9.4	U	7.2	U	5.1	U	5.6	U	4.9	U	5.3	U	5.3	U	5.2	U	5.4	U		
Chlorobenzene	1,600,000	130,000	1,000	--			440	U	410	U	90	U	5.1	U	5.1	U	4.7	U	4.8	U	9.4	U	7.2	U	5.1	U	5.6	U	4.9	U	5.3	U	5.3	U	5.2	U	5.4	U		
Chloroethane	NL	NL	NL	NL			440	U	410	U	90	U	5.1	U	5.1	U	4.7	U	4.8	U	9.4	U	7.2	U	5.1	U	5.6	U	4.9	U	5.3	U	5.3	U	5.2	U	5.4	U		
Chloroform	100,000	300	600	--			440	U	410	U	90	U	5.1	U	5.1	U	4.7	U	4.8	U	9.4	U	7.2	U	5.1	U	5.6	U	4.9	U	5.3	U	5.3	U	5.2	U	5.4	U		
Chloromethane	NL	NL	NL	NL			440	U	410	U	90	U	5.1	U	5.1	U	4.7	U	4.8	U	9.4	U	7.2	U	5.1	U	5.6	U	4.9	U	5.3	U	5.3	U	5.2	U	5.4	U		
cis-1,3-Dichloropropene	NL	NL	NL	NL			440	U	410	U	90	U	5.1	U	5.1	U	4.7	U	4.8	U	9.4	U	7.2	U	5.1	U	5.6	U	4.9	U	5.3	U	5.3	U	5.2	U	5.4	U		
Ethylbenzene	7,800,000	400,000	13,000	--			110	U	100	U	22	U	5.1	U	5.1	U	4.7	U	4.8	U	9.4	U	7.2	U	3.1	Ja	5.6	U	4.9	U	5.3	U	5.3	U	5.2	U	2.8	Ja		
Methylene chloride	85,000	13,000	20	--			440	U	410	U	90	U	5.1	U	5.1	U	4.7	U	4.8	U	6.8	Ja	14		5.1	U	6.8		17		6.8		5.3	U	5.2	U	5.4	U		
Styrene	16,000,000	1,500,000	4,000	--			440	U	410	U	90	U	5.1	U	5.1	U	4.7	U	4.8	U	9.4	U	7.2	U	5.1	U	5.6	U	4.9	U	5.3	U	5.3	U	5.2	U	5.4	U		
Tetrachloroethene	12,000	11,000	60	--			360,000		150,000		2,200		520		62		73		170		180		220		660		38		130		32		46		35		23			
Toluene	16,000,000	650,000	12,000	--			1,700		2,300		22	U	5.1	U	5.1	U	6.4	M	4.8	U	9.4	U	7.2	U	9.6		5.6	U	4.9	U	5.3	U	5.3	U	6.8		7	H		
trans-1,3-Dichloropropene	NL	NL	NL	NL			440	U	410	U	90	U	5.1	U	5.1	U	4.7	U	4.8	U	9.4	U	7.2	U	5.1	U	5.6	U	4.9	U	5.3	U	5.3	U	5.2	U	5.4	U		
Trichloroethene	58,000	5,000	60	--			18,000		10,000		90	U	4.5	Ja	3.3	Ja	5.4		6.3		8.1	Ja	12		27		5.6	U	9.8		5.3	U	5.3	U	5.2	U	5.4	U		
Vinyl chloride	460	280	10	--			440	U	410	U	90	U	5.1	U	5.1	U	4.7	U	4.8	U	9.4	U	7.2	U	5.1	U	5.6	U	4.9	U	5.3	U	5.3	U	5.2	U	5.4	U		
Xylenes (total)	160,000,000	320,000	150,000	--			330	U	310	U	67	U	5.1	U	5.1	U	3.3	Ja	4.8	U	9.4	U	7.2	U	3.9	Ja	5.8	U	4.9	U	5.3	U	5.3	U	3.1	Ja	7.4			
DRO/JP-4							89,000	U	89,000	U	4,800	U	4,700	U	4,300	U	4,200	U	4,200	U	4,300	U	4,200	U	4,300	U	4,200	U	4,800	U	4,300	U	4,300	U	4,300	U	4,200	U	4,300	U
Arsenic,TCLP	50						50	U	50	U	50	U	50	U	50	U	50	U	50	U	50	U	50	U	50	U	50	U	50	U	50	U	50	U	50	U	50	U		
Barium,TCLP	2,000						390	B	390		780	B	500	B	280	B	480	B	360	B	430	B	430	B	500	B	370	B	420	B	350	B	390	B	320	B	320	B		
Cadmium,TCLP	5						5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U		
Chromium,TCLP	100						50	U	50	U	50	U	50	U	50	U	50	U	50	U	50	U	50	U	50	U	50	U	50	U	50	U	50	U	50	U	50	U		
Lead,TCLP	7.5						9.2		7.5	U	7.5	U	7.5	U	7.5	U	7.5	U	7.5	U	7.5	U	7.5	U	7.5	U	7.5	U	7.5	U	7.5	U	7.5	U	7.5	U	7.5	U		
Mercury,TCLP	2						2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U</												

Appendix B
SOIL ANALYTICAL RESULTS – OUTSIDE CONTAINER STORAGE AREA (OSA)
(S1-S8) – VOCs, DRO/JP-4, and RCRA METALS
AREA 9/10
SER GROUNDWATER CONTAMINATION SUPERFUND SITE
ROCKFORD, IL
S2

SECOR

Analyte	ROD - Preliminary Remediation Goals and/or Section 742 Table A: Tier 1 Soil Remediation Objectives for Residential Properties				Location Depth Sample Date		SB-S2 2-4'	SB-S2 4-6'	SB-S2 6-8'	SB-S2 8-10'	SB-S2 10-12'	SB-S2 12-14'	SB-S2 14-18'	SB-S2 16-18'	SB-S2 18-20'	SB-S2 20-32'	SB-S2 22-24'	SB-S2 24-28'	SB-S2 26-28'	SB-S2 28-30'	SB-S2 30-32'																
	Soil Ingestion (ug/kg)	Soil Inhalation (ug/kg)	Soil Component of Groundwater Class 1 (ug/kg)	ADL	Units		ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg																
					RES	Q																															
1,1,1-Trichloroethane	NL	1,200,000	2,000	**			240,000		370		43		23	M	17		58		39		38	H	540		330		23		H	13		9.2		22		19	
1,1,2,2-Tetrachloroethane	NL	NL	NL	NL			170	U	94	U	4.7	U	4.8	U	4.6	U	4.8	U	4.9	U	7.6	U	90	U	100	U	5.1	U	5.1	U	5.1	U	5.2	U	4.9	U	
1,1,2-Trichloroethane	310,000	1,800,000	20	--			170	U	94	U	4.7	U	4.8	U	4.6	U	4.8	U	4.9	U	7.6	U	90	U	100	U	5.1	U	5.1	U	5.1	U	5.2	U	4.9	U	
1,1-Dichloroethane	7,800,000	1,300,000	23,000	--			8,100		94	U	6.8		3	Ja	4.6	U	9.7	H	5.8		7.6	U	110		100	U	2.7		Ja	5.1	U	5.1	U	5.2	U	4.9	U
1,1-Dichloroethene	700,000	1,500,000	60	--			1,300		94	U	4.7	U	4.8	U	4.6	U	4.8	U	4.9	U	7.6	U	90	U	100	U	5.1	U	5.1	U	5.1	U	5.2	U	4.9	U	
1,2-Dichloroethane	7,000	400	20	--			170	U	94	U	4.7	U	4.8	U	4.6	U	4.8	U	4.9	U	7.6	U	90	U	100	U	5.1	U	5.1	U	5.1	U	5.2	U	4.9	U	
1,2-Dichloroethene (total)	NL	NL	NL	NL			7,200		280		30		13		11		28		18		10		320		210		8.1			5.1	U	5.1	U	5.8		4.9	U
1,2-Dichloropropane	9,000	15,000	30	--			170	U	94	U	4.7	U	4.8	U	4.6	U	4.8	U	4.9	U	7.6	U	90	U	100	U	5.1	U	5.1	U	5.1	U	5.2	U	4.9	U	
2-Butanone (MEK)	NL	NL	NL	NL			170	U	94	U	4.7	U	4.8	U	4.6	U	4.8	U	4.9	U	7.6	U	90	U	100	U	5.1	U	5.1	U	5.1	U	5.2	U	4.9	U	
2-Hexanone	NL	NL	NL	NL			170	U	94	U	4.7	U	4.8	U	4.6	U	4.8	U	4.9	U	7.6	U	90	U	100	U	5.1	U	5.1	U	5.1	U	5.2	U	4.9	U	
4-Methyl-2-pentanone (MIBK)	NL	NL	NL	NL			170	U	94	U	4.7	U	4.8	U	4.6	U	4.8	U	4.9	U	7.6	U	90	U	100	U	5.1	U	5.1	U	5.1	U	5.2	U	4.9	U	
Acetone	7,800,000	100,000,000	16,000	--			170	U	94	U	14		4.8	U	50		4.8	U	4.9	U	7.6	U	90	U	100	U	5.1	U	5.1	U	4.8		5.2	U	11		
Benzene	12,000	800	30	--			42		23	U	4.7	U	4.8	U	4.6	U	4.8	U	4.9	U	7.6	U	22		25	U	5.1	U	5.1	U	5.1	U	5.2	U	4.9	U	
Bromodichloromethane	10,000	3,000,000	600	--			170	U	94	U	4.7	U	4.8	U	4.6	U	4.8	U	4.9	U	7.6	U	90	U	100	U	5.1	U	5.1	U	5.1	U	5.2	U	4.9	U	
Bromoform	81,000	53,000	800	--			170	U	94	U	4.7	U	4.8	U	4.6	U	4.8	U	4.9	U	7.6	U	90	U	100	U	5.1	U	5.1	U	5.1	U	5.2	U	4.9	U	
Bromomethane	110,000	10,000	200	--			170	U	94	U	4.7	U	4.8	U	4.6	U	4.8	U	4.9	U	7.6	U	90	U	100	U	5.1	U	5.1	U	5.1	U	5.2	U	4.9	U	
Carbon disulfide	7,800,000	720,000	32,000	--			170	U	94	U	4.7	U	4.8	U	4.6	U	4.8	U	4.9	U	7.6	U	90	U	100	U	5.1	U	5.1	U	5.1	U	5.2	U	4.9	U	
Carbon tetrachloride	5,000	300	70	--			170	U	94	U	4.7	U	4.8	U	4.6	U	4.8	U	4.9	U	7.6	U	90	U	100	U	5.1	U	5.1	U	5.1	U	5.2	U	4.9	U	
Chlorobenzene	1,600,000	130,000	1,000	--			170	U	94	U	4.7	U	4.8	U	4.6	U	4.8	U	4.9	U	7.6	U	90	U	100	U	5.1	U	5.1	U	5.1	U	5.2	U	4.9	U	
Chloroethane	NL	NL	NL	NL			170	U	94	U	4.7	U	4.8	U	4.6	U	4.8	U	4.9	U	7.6	U	90	U	100	U	5.1	U	5.1	U	5.1	U	5.2	U	4.9	U	
Chloroform	100,000	300	600	--			170	U	94	U	4.7	U	4.8	U	4.6	U	4.8	U	4.9	U	7.6	U	90	U	100	U	5.1	U	5.1	U	5.1	U	5.2	U	4.9	U	
Chloromethane	NL	NL	NL	NL			170	U	94	U	4.7	U	4.8	U	4.6	U	4.8	U	4.9	U	7.6	U	90	U	100	U	5.1	U	5.1	U	5.1	U	5.2	U	4.9	U	
cis-1,3-Dichloropropene	NL	NL	NL	NL			170	U	94	U	4.7	U	4.8	U	4.6	U	4.8	U	4.9	U	7.6	U	90	U	100	U	5.1	U	5.1	U	5.1	U	5.2	U	4.9	U	
Ethylbenzene	7,800,000	400,000	13,000	--			42		23	U	4.7	U	4.8	U	4.6	U	4.8	U	4.9	U	7.6	U	22		25	U	5.1	U	5.1	U	5.1	U	5.2	U	4.9	U	
Methylene chloride	85,000	13,000	20	--			170	U	94	U	12		4.8	U	4.6	U	4.8	U	4.9	U	11		90	U	100	U	9.8			5.1	U	5.1	U	5.2	U	4.9	U
Styrene	16,000,000	1,500,000	4,000	--			170	U	94	U	4.7	U	4.8	U	4.6	U	4.8	U	4.9	U	7.6	U	90	U	100	U	5.1	U	5.1	U	5.1	U	5.2	U	4.9	U	
Tetrachloroethene	12,000	11,000	60	--			320,000		1,100		120		120		87		150		140		190		1,800		890		98		55		40		74		48		
Toluene	16,000,000	650,000	12,000	--			540		23	U	4.7	U	4.8	U	9.8		4.8	U	4.9	U	7.6	U	22		25	U	5.1	U	5.1	U	11		5.2	U	6.2		
trans-1,3-Dichloropropene	NL	NL	NL	NL			170	U	94	U	4.7	U	4.8	U	4.6	U	4.8	U	4.9	U	7.6	U	90	U	100	U	5.1	U	5.1	U	5.1	U	5.2	U	4.9	U	
Trichloroethene	58,000	5,000	60	--			20,000		110		11		7		4.9		13		9.8		8.7		140		100	U	8.4			5.1	U	5.1	U	5.2	U	4.9	U
Vinyl chloride	480	280	10	--			170	U	94	U	4.7	U	4.8	U	4.6	U	4.8	U	4.9	U	7.6	U	90	U	100	U	5.1	U	5.1	U	5.1	U	5.2	U	4.9	U	
Xylenes (total)	160,000,000	320,000	150,000	--			130	U	70	U	4.7	U	4.8	U	4.6	U	4.8	U	4.9	U	7.6	U	67		75	U	5.1	U	5.1	U	5.1	U	5.2	U	4.9	U	
DRO/JP-4							4,900	U	4,700	U	4,500	U	4,400	U	4,300	U	4,200	U	4,300	U	4,400	U	4,800	U	5,100	U	4,300	U	4,200	U	4,200	U	4,300	U	4,200	U	
			ug/L				ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		
Arsenic,TCLP			50				11	B	50	U	50	U	50	U	50	U	50	U	50	U	50	U	50	U	50	U	50	U	50	U	50	U	50	U	50	U	
Barium,TCLP			2,000				320	B	320	U	660	B	200	B	380	B	370	B	400	B	470	B	470	B	400	B	370	B	350	B	300	B	300	B			
Cadmium,TCLP			5				5	U	5	U	5	U	5	U	5	U	5	U	5	U	12		4	B	5	U	5	U	5	U	5	U	5	U	5	U	
Chromium,TCLP			100				50	U	50	U	50	U	50	U	50	U	50	U	50	U	50	U	50	U	50	U	50	U	50	U	50	U	50	U	50	U	
Lead,TCLP			7.5				7.5	U	7.5	U	7.5	U	7.5	U	7.5	U	7.5	U	7.5	U	7.5	U	7.5	U	7.5	U	7.5	U	7.5	U	7.5	U	7.5	U	7.5	U	
Mercury,TCLP			2				2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	
Selenium,TCLP			50				50	U	50	U	50	U	50	U	50	U	50	U	50	U	50	U	50	U	50	U	50	U	50	U	50	U	50	U	50	U	
Silver,TCLP			50				50	U	50	U	50	U	50	U	50	U	50	U	50	U	50	U	50	U	50	U	50	U	50	U	50	U	50	U	50	U	

See endnotes for analytical qualifier explanation.

Appendix B
SOIL ANALYTICAL RESULTS – OUTSIDE CONTAINER STORAGE AREA (OSA)
(S1-S8) – VOCs, DRO/JP-4, and RCRA METALS
AREA 9/10
SER GROUNDWATER CONTAMINATION SUPERFUND SITE
ROCKFORD, IL
S3

SECOR

Analyte	ROD - Preliminary Remediation Goals and/or Section 742, Table A: Tier 1 Soil Remediation Objectives for Residential Properties				Location Depth Sample Date	SB-S3 0-2'		SB-S3 2-4'		SB-S3 4-4'		SB-S3 6-6'		SB-S3 8-10'		SB-S3 10-12'		SB-S3 12-14'		SB-S3 14-16'		SB-S3 16-18'		SB-S3 18-20'		SB-S3 20-22'		SB-S3 22-24'		SB-S3 24-26'		SB-S3 26-26'		SB-S3 28-30'		SB-S3 30-32'				
	Soil Ingestion (ug/kg)	Soil Inhalation (ug/kg)	Soil Component of Groundwater Class 1 (ug/kg)	ADL (ug/kg)		Units		ug/kg		ug/kg		ug/kg		ug/kg		ug/kg		ug/kg		ug/kg		ug/kg		ug/kg		ug/kg		ug/kg		ug/kg		ug/kg		ug/kg		ug/kg				
						RES	Q																																	
1,1,1-Trichloroethane	NL	1,200,000	2,000	--			680	U	4,800	U	170	U	8.1	H	12	H	55	U	58	U	29	H	42	U	480	U	110	U	8.8	H	12	H	8.8	M	9.6	H	9.7	H	19	M
1,1,2,2-Tetrachloroethane	NL	NL	NL	NL			81	U	120	U	4.4	U	4.9	U	5	U	4.7	U	4.9	U	5.3	U	4.9	U	91	U	5	U	5.3	U	5.3	U	5.3	U	4.9	U	4.5	U	5.1	U
1,1,2-Trichloroethane	310,000	1,800,000	20	--			81	U	120	U	4.4	U	4.9	U	5	U	4.7	U	4.9	U	5.3	U	4.9	U	91	U	5	U	5.3	U	5.3	U	5.3	U	4.9	U	4.5	U	5.1	U
1,1-Dichloroethane	7,800,000	1,300,000	23,000	--			100	U	1,300	U	58	U	4.9	U	5	U	10	M	8.2	U	5.3	U	3.7	Ja	120	U	38	U	5.3	U	5.3	U	5.3	U	4.9	U	4.5	U	5.1	U
1,1-Dichloroethene	700,000	1,500,000	60	--			81	U	120	U	4.4	U	4.9	U	5	U	4.7	U	4.9	U	5.3	U	4.9	U	91	U	5	U	5.3	U	5.3	U	5.3	U	4.9	U	4.5	U	5.1	U
1,2-Dichloroethane	7,000	400	20	--			81	U	120	U	4.4	U	4.9	U	5	U	4.7	U	4.9	U	5.3	U	4.9	U	91	U	5	U	5.3	U	5.3	U	5.3	U	4.9	U	4.5	U	5.1	U
1,2-Dichloroethene (total)	NL	NL	NL	NL			81	U	750	U	40	U	4.9	U	5	U	9.2	U	8.8	U	2.7	Ja	4	Ja	110	U	27	U	5.3	U	5.3	U	5.3	U	4.9	U	4.5	U	5.1	U
1,2-Dichloropropane	9,000	15,000	30	--			81	U	120	U	4.4	U	4.9	U	5	U	4.7	U	4.9	U	5.3	U	4.9	U	91	U	5	U	5.3	U	5.3	U	5.3	U	4.9	U	4.5	U	5.1	U
2-Butanone (MEK)	NL	NL	NL	NL			81	U	120	U	4.4	U	4.9	U	5	U	4.7	U	4.9	U	5.3	U	4.9	U	91	U	5	U	5.3	U	5.3	U	5.3	U	4.9	U	4.5	U	5.1	U
2-Hexanone	NL	NL	NL	NL			81	U	120	U	4.4	U	4.9	U	5	U	4.7	U	4.9	U	5.3	U	4.9	U	91	U	5	U	5.3	U	5.3	U	5.3	U	4.9	U	4.5	U	5.1	U
4-Methyl-2-pentanone (MIBK)	NL	NL	NL	NL			81	U	120	U	4.4	U	4.9	U	5	U	4.7	U	4.9	U	5.3	U	4.9	U	91	U	5	U	5.3	U	5.3	U	5.3	U	4.9	U	4.5	U	5.1	U
Acetone	7,800,000	100,000,000	16,000	--			81	U	120	U	4.4	U	4.9	U	5	U	4.7	U	4.9	U	5.3	U	4.9	U	91	U	5	U	5.3	U	5.3	U	5.3	U	4.9	U	4.5	U	5.1	U
Benzene	12,000	800	30	--			20	U	30	U	4.4	U	4.9	U	5	U	4.7	U	4.9	U	5.3	U	4.9	U	23	U	4	Ja	5.3	U	5.3	U	5.3	U	4.9	U	4.5	U	5.1	U
Bromodichloromethane	10,000	3,000,000	600	--			81	U	120	U	4.4	U	4.9	U	5	U	4.7	U	4.9	U	5.3	U	4.9	U	91	U	5	U	5.3	U	5.3	U	5.3	U	4.9	U	4.5	U	5.1	U
Bromoform	81,000	53,000	800	--			81	U	120	U	4.4	U	4.9	U	5	U	4.7	U	4.9	U	5.3	U	4.9	U	91	U	5	U	5.3	U	5.3	U	5.3	U	4.9	U	4.5	U	5.1	U
Bromomethane	110,000	10,000	200	--			81	U	120	U	4.4	U	4.9	U	5	U	4.7	U	4.9	U	5.3	U	4.9	U	91	U	5	U	5.3	U	5.3	U	5.3	U	4.9	U	4.5	U	5.1	U
Carbon disulfide	7,800,000	720,000	32,000	--			81	U	120	U	4.4	U	4.9	U	5	U	4.7	U	4.9	U	5.3	U	4.9	U	91	U	5	U	5.3	U	5.3	U	5.3	U	4.9	U	4.5	U	5.1	U
Carbon tetrachloride	5,000	300	70	--			81	U	120	U	4.4	U	4.9	U	5	U	4.7	U	4.9	U	5.3	U	4.9	U	91	U	5	U	5.3	U	5.3	U	5.3	U	4.9	U	4.5	U	5.1	U
Chlorobenzene	1,600,000	130,000	1,000	--			81	U	120	U	4.4	U	4.9	U	5	U	4.7	U	4.9	U	5.3	U	4.9	U	91	U	5	U	5.3	U	5.3	U	5.3	U	4.9	U	4.5	U	5.1	U
Chloroethane	NL	NL	NL	NL			81	U	120	U	4.4	U	4.9	U	5	U	4.7	U	4.9	U	5.3	U	4.9	U	91	U	5	U	5.3	U	5.3	U	5.3	U	4.9	U	4.5	U	5.1	U
Chloroform	100,000	300	600	--			81	U	120	U	4.4	U	4.9	U	5	U	4.7	U	4.9	U	5.3	U	4.9	U	91	U	5	U	5.3	U	5.3	U	5.3	U	4.9	U	4.5	U	5.1	U
Chloromethane	NL	NL	NL	NL			81	U	120	U	4.4	U	4.9	U	5	U	4.7	U	4.9	U	5.3	U	4.9	U	91	U	5	U	5.3	U	5.3	U	5.3	U	4.9	U	4.5	U	5.1	U
cis-1,3-Dichloropropene	NL	NL	NL	NL			81	U	120	U	4.4	U	4.9	U	5	U	4.7	U	4.9	U	5.3	U	4.9	U	91	U	5	U	5.3	U	5.3	U	5.3	U	4.9	U	4.5	U	5.1	U
Ethylbenzene	7,800,000	400,000	13,000	--			20	U	30	U	4.4	U	4.9	U	5	U	4.7	U	4.9	U	5.3	U	4.9	U	23	U	5	U	5.3	U	5.3	U	5.3	U	4.9	U	4.5	U	5.1	U
Methylene chloride	85,000	13,000	20	--			81	U	120	U	4.4	U	4.9	U	5.4		10		7.7		5.3	U	4.9	U	91	U	5	U	14		6.5		5.3	U	4.9	U	4.5	U	11	
Styrene	16,000,000	1,500,000	4,000	--			81	U	120	U	4.4	U	4.9	U	5	U	4.7	U	4.9	U	5.3	U	4.9	U	91	U	5	U	5.3	U	5.3	U	5.3	U	4.9	U	4.5	U	5.1	U
Tetrachloroethene	12,000	11,000	60	--			2,200		20,000		120		12		22		75		82		61		82		800		98		28		32		25		28		21		49	
Toluene	16,000,000	650,000	12,000	--			20	U	30	U	4.4	U	4.9	U	5	U	4.7	U	4.9	U	5.3	U	4.9	U	23	U	7.8		5.3	U	5.3	U	5.3	U	4.9	U	4.5	U	5.1	U
trans-1,3-Dichloropropene	NL	NL	NL	NL			81	U	120	U	4.4	U	4.9	U	5	U	4.7	U	4.9	U	5.3	U	4.9	U	91	U	5	U	5.3	U	5.3	U	5.3	U	4.9	U	4.5	U	5.1	U
Trichloroethene	58,000	5,000	60	--			81	U	450		9.2		4.9	U	5	U	4	Ja	5		5.3	U	3.8	Ja	91	U	6.2		5.3	U	5.3	U	5.3	U	4.9	U	4.5	U	5.1	U
Vinyl chloride	480	280	10	--			81	U	120	U	4.4	U	4.9	U	5	U	4.7	U	4.9	U	5.3	U	4.9	U	91	U	5	U	5.3	U	5.3	U	5.3	U	4.9	U	4.5	U	5.1	U
Xylenes (total)	160,000,000	320,000	150,000	--			61	U	90	U	4.4	U	4.9	U	5	U	4.7	U	4.9	U	5.3	U	4.9	U	68	U	5	U	5.3	U	5.3	U	5.3	U	4.9	U	4.5	U	5.1	U
DRO/JP-4							4,400	U*	4,900	U*	4,900	U*	4,400	U*	4,400	U*	4,300	U*	4,300	U*	4,200	U*	4,300	U*	4,600	U*	4,800	U*	4,300	U*	4,300	U*	4,300	U*	4,200	U*	4,300	U*	4,200	U*
Arsenic,TCLP		50					50	U	50	U	50	U	50	U	50	U	50	U	50	U	50	U	50	U	50	U	50	U	50	U	50	U	50	U	50	U	50	U	50	U
Barium,TCLP		2,000					700	B	740	B	740	B	590	B	430	B	410	B	420	B	410	B	410	B	430	B	350	B	370	B	390	B	400	B	330	B	400	B	410	B
Cadmium,TCLP		5					10	B	4	B	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
Chromium,TCLP		100					50	U	50	U	50	U	50	U	50	U	50	U	50	U	50	U	50	U	50	U	50	U	50	U	50	U	50	U	50	U	50	U	50	U
Lead,TCLP		7.5					7.5	U	7	B	7.5	U																												

Appendix B
SOIL ANALYTICAL RESULTS – OUTSIDE CONTAINER STORAGE AREA (OSA)
(S1-S8) – VOCs, DRO/JP-4, and RCRA METALS
AREA 9/10
SER GROUNDWATER CONTAMINATION SUPERFUND SITE
ROCKFORD, IL
S4

Analyte	ROD - Preliminary Remediation Goals and/or Section 742 Table A: Tier 1 Soil Remediation Objectives for Residential Properties				Location Depth Sample Date	SB-S4	SB-S4	SB-S4	SB-S4	SB-S4	SB-S4	SB-S4	SB-S4	SB-S4	SB-S4	SB-S4	SB-S4	SB-S4	SB-S4	SB-S4	SB-S4		
						0-2'	2-4'	4-6'	6-8'	8-10'	10-12'	12-14'	14-16'	16-18'	18-20'	20-22'	22-24'	24-26'	26-28'	28-30'	30-32'		
						10/29/2003	10/29/2003	10/29/2003	10/29/2003	10/29/2003	10/29/2003	10/29/2003	10/29/2003	10/29/2003	10/29/2003	10/29/2003	10/29/2003	10/29/2003	10/29/2003	10/29/2003	10/29/2003		
	Soil Ingestion (ug/kg)	Soil Inhalation (ug/kg)	Soil Component of Groundwater Class 1 (ug/kg)	ADL (ug/kg)		Units		ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	
						RES	Q																
1,1,1-Trichloroethane	NL	1,200,000	2,000	**		1,200	1,500		440	130	18	22		45	47	710	600	890	11	7.9	9.4	25	19
1,1,2,2-Tetrachloroethane	NL	NL	NL	NL		100	U	92	U	9.6	U	4.4	U	5.3	U	5.1	U	83	U	85	U	5.3	U
1,1,2-Trichloroethane	310,000	1,800,000	20	**		100	U	92	U	8.3	Ja	4.4	U	5.3	U	5.1	U	83	U	85	U	5.3	U
1,1-Dichloroethane	7,800,000	1,300,000	23,000	**		100	U	170		310		32		5.3	U	5.1	U	7.3		5.7	U	130	
1,1-Dichloroethane	700,000	1,500,000	60	**		100	U	92	U	9.6	U	4.4	U	5.3	U	5.1	U	5.1	U	5.7	U	100	U
1,2-Dichloroethane	7,000	400	20	**		100	U	92	U	9.6	U	4.4	U	5.3	U	5.1	U	5.1	U	5.7	U	100	U
1,2-Dichloroethane (total)	NL	NL	NL	NL		300		450		200		78		5.1	Ja	7.1		17		10		310	
1,2-Dichloropropane	8,000	15,000	30	**		100	U	92	U	9.6	U	4.4	U	5.3	U	5.1	U	5.1	U	5.7	U	100	U
2-Butanone (MEK)	NL	NL	NL	NL		100	U	92	U	9.6	U	4.4	U	5.3	U	5.1	U	5.1	U	5.7	U	100	U
2-Hexanone	NL	NL	NL	NL		100	U	92	U	9.6	U	4.4	U	5.3	U	5.1	U	5.1	U	5.7	U	100	U
4-Methyl-2-pentanone (MIBK)	NL	NL	NL	NL		100	U	92	U	9.6	U	4.4	U	5.3	U	5.1	U	5.1	U	5.7	U	100	U
Acetone	7,800,000	100,000,000	16,000	**		100	U	92	U	9.6	U	4.4	U	5.3	U	5.1	U	5.1	U	5.7	U	100	U
Benzene	12,000	800	30	**		25	U	23	U	9.6	U	4.4	U	5.3	U	5.1	U	5.1	U	5.7	U	25	U
Bromodichloromethane	10,000	3,000,000	600	**		100	U	92	U	9.6	U	4.4	U	5.3	U	5.1	U	5.1	U	5.7	U	100	U
Bromoform	81,000	53,000	800	**		100	U	92	U	9.6	U	4.4	U	5.3	U	5.1	U	5.1	U	5.7	U	100	U
Bromomethane	110,000	10,000	200	**		100	U	92	U	9.6	U	4.4	U	5.3	U	5.1	U	5.1	U	5.7	U	100	U
Carbon disulfide	7,800,000	720,000	32,000	**		100	U	92	U	9.6	U	4.4	U	5.3	U	5.1	U	5.1	U	5.7	U	100	U
Carbon tetrachloride	5,000	300	70	**		100	U	92	U	9.6	U	4.4	U	5.3	U	5.1	U	5.1	U	5.7	U	100	U
Chlorobenzene	1,600,000	130,000	1,000	**		100	U	92	U	9.6	U	4.4	U	5.3	U	5.1	U	5.1	U	5.7	U	100	U
Chloroethane	NL	NL	NL	NL		100	U	92	U	9.6	U	4.4	U	5.3	U	5.1	U	5.1	U	5.7	U	100	U
Chloroform	100,000	300	600	**		100	U	92	U	9.6	U	4.4	U	5.3	U	5.1	U	5.1	U	5.7	U	100	U
Chloromethane	NL	NL	NL	NL		100	U	92	U	9.6	U	4.4	U	5.3	U	5.1	U	5.1	U	5.7	U	100	U
cis-1,3-Dichloropropene	NL	NL	NL	NL		100	U	92	U	9.6	U	4.4	U	5.3	U	5.1	U	5.1	U	5.7	U	100	U
Ethylbenzene	7,800,000	400,000	13,000	**		25	U	23	U	9.6	U	4.4	U	5.3	U	5.1	U	5.1	U	5.7	U	25	U
Methylene chloride	85,000	13,000	20	**		100	U	92	U	12		11		8.2		5.1	U	9.4		5.7	U	100	U
Styrene	16,000,000	1,500,000	4,000	**		100	U	92	U	9.6	U	4.4	U	5.3	U	5.1	U	5.1	U	5.7	U	100	U
Tetrachloroethene	12,000	11,000	60	**		5,100		4,400		580		110		61		46		100		120		1,600	
Toluene	16,000,000	650,000	12,000	**		25	U	23	U	9.6	U	4.4	U	5.3	U	5.1	U	5.1	U	5.7	U	25	U
trans-1,3-Dichloropropene	NL	NL	NL	NL		100	U	92	U	9.6	U	4.4	U	5.3	U	5.1	U	5.1	U	5.7	U	100	U
Trichloroethene	58,000	5,000	60	**		300		310		120		13		2.7	Ja	3.1	Ja	6.8		7.1		100	
Vinyl chloride	480	280	10	**		100	U	92	U	9.6	U	4.4	U	5.3	U	5.1	U	5.1	U	5.7	U	100	U
Xylenes (total)	160,000,000	320,000	150,000	**		75	U	69	U	9.6	U	4.4	U	5.3	U	5.1	U	5.1	U	5.7	U	75	U
DRO/JP-4						4,600	U*	5,100	U*	4,700	U*	4,800	U*	4,300	U*	4,300	U*	4,300	U*	4,700	U*	4.4	U*
																					5,200	U*	
																					4,200	U*	
																					4,300	U*	
																					4,300	U*	
Arsenic,TCLP	50					50	U	50	U	50	U	50	U	50	U	50	U	50	U	50	U	50	U
Barium,TCLP	2,000					330	B	840	B	790	B	530	B	530	B	120	B	450	B	310	B	350	B
Cadmium,TCLP	5					7	U	5	U	5	U	5	U	5	U	5	U	100	U	100	U	140	U
Chromium,TCLP	100					50	U	50	U	50	U	50	U	50	U	50	U	50	U	50	U	50	U
Lead,TCLP	7.5					6.5	B	7.5	U	7.5	U	7.5	U	7.5	U	7.5	U	7.5	U	7.5	U	7.5	U
Mercury,TCLP	2					2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
Selenium,TCLP	50					50	U	50	U	50	U	50	U	50	U	50	U	50	U	50	U	50	U
Silver,TCLP	50					50	U	50	U	50	U	50	U	50	U	50	U	50	U	50	U	50	U

See endnotes for analytical qualifier explanation.

Appendix B
SOIL ANALYTICAL RESULTS – OUTSIDE CONTAINER STORAGE AREA (OSA)
(S1-S8) – VOCs, DRO/JP-4, and RCRA METALS
AREA 9/10
SER GROUNDWATER CONTAMINATION SUPERFUND SITE
ROCKFORD, IL
S5

SECOR

Analyte	ROD - Preliminary Remediation Goals and/or Section 742 Table A: Tier 1 Soil Remediation Objectives for Residential Properties				Location Depth Sample Data	SB-S5 2-4'	SB-S5 4-6'	SB-S5 6-8'	SB-S5 8-10'	SB-S5 10-12'	SB-S5 12-14'	SB-S5 14-16'	SB-S5 16-18'	SB-S5 18-20'	SB-S5 20-22'	SB-S5 22-24'	SB-S5 24-26'	SB-S5 28-28'	SB-S5 28-30'	SB-S5 30-32'																
	Soil Ingestion (ug/kg)	Soil Inhalation (ug/kg)	Soil Component of Groundwater Class 1 (ug/kg)	ADL (ug/kg)		Units		ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg															
						RES	Q																													
1,1,1-Trichloroethane	NL	1,200,000	2,000	**			230		860		130		18	H	100	U	23	H	22	H	35		250		300		23	H	12	H	21	H	20	H	24	H
1,1,2,2-Tetrachloroethane	NL	NL	NL	NL	NL	NL	90	U	85	U	77	U	5	U	100	U	4.5	U	4.9	U	5.2	U	91	U	5	U	5	U	4.9	U	5	U	4.7	U	4.8	U
1,1,2-Trichloroethane	310,000	1,800,000	20	**			90	U	85	U	77	U	5	U	100	U	4.5	U	4.9	U	5.2	U	91	U	5	U	5	U	4.9	U	5	U	4.7	U	4.8	U
1,1-Dichloroethane	7,800,000	1,300,000	23,000	**			90	U	85	U	77	U	5	U	100	U	4.5	U	4.9	U	5.2	U	91	U	55		3.4	Ja	4.9	U	5.3		3.9	Ja	4.8	U
1,1-Dichloroethane	700,000	1,500,000	60	**			90	U	85	U	77	U	5	U	100	U	4.5	U	4.9	U	5.2	U	91	U	5	U	5	U	4.9	U	5	U	4.7	U	4.8	U
1,2-Dichloroethane	7,000	400	20	**			90	U	85	U	77	U	5	U	100	U	4.5	U	4.9	U	5.2	U	91	U	5	U	5	U	4.9	U	5	U	4.7	U	4.8	U
1,2-Dichloroethane (total)	NL	NL	NL	NL	NL	NL	90	U	85	U	77	U	4.3	Ja	100	U	7.1		5.6		4.9		110		130		7.5		4.9	U	11		7.9		9.2	
1,2-Dichloropropane	9,000	15,000	30	**			90	U	85	U	77	U	5	U	100	U	4.5	U	4.9	U	5.2	U	91	U	5	U	5	U	4.9	U	5	U	4.7	U	4.8	U
2-Butanone (MEK)	NL	NL	NL	NL	NL	NL	90	U	85	U	77	U	5	U	100	U	4.5	U	4.9	U	5.2	U	91	U	5	U	5	U	4.9	U	5	U	4.7	U	4.8	U
2-Hexanone	NL	NL	NL	NL	NL	NL	90	U	85	U	77	U	5	U	100	U	4.5	U	4.9	U	5.2	U	91	U	5	U	5	U	4.9	U	5	U	4.7	U	4.8	U
4-Methyl-2-pentanone (MIBK)	NL	NL	NL	NL	NL	NL	90	U	85	U	77	U	5	U	100	U	4.5	U	4.9	U	5.2	U	91	U	5	U	5	U	4.9	U	5	U	4.7	U	4.8	U
Acetone	7,800,000	100,000,000	16,000	**			90	U	85	U	77	U	5	U	100	U	4.5	U	4.9	U	5.2	U	91	U	5	U	6.8		4.8	U	5	U	4	Ja	4.8	U
Benzene	12,000	800	30	**			23	U	21	U	19	U	5	U	25	U	4.5	U	4.9	U	5.2	U	23	U	5	U	5	U	4.9	U	5	U	4.7	U	4.8	U
Bromodichloromethane	10,000	3,000,000	600	**			90	U	85	U	77	U	5	U	100	U	4.5	U	4.9	U	5.2	U	91	U	5	U	5	U	4.9	U	5	U	4.7	U	4.8	U
Bromoform	81,000	53,000	800	**			90	U	85	U	77	U	5	U	100	U	4.5	U	4.9	U	5.2	U	91	U	5	U	5	U	4.9	U	5	U	4.7	U	4.8	U
Bromomethane	110,000	10,000	200	**			90	U	85	U	77	U	5	U	100	U	4.5	U	4.9	U	5.2	U	91	U	5	U	5	U	4.9	U	5	U	4.7	U	4.8	U
Carbon disulfide	7,800,000	720,000	32,000	**			90	U	85	U	77	U	5	U	100	U	4.5	U	4.9	U	5.2	U	91	U	5	U	5	U	4.9	U	5	U	4.7	U	4.8	U
Carbon tetrachloride	5,000	300	70	**			90	U	85	U	77	U	5	U	100	U	4.5	U	4.9	U	5.2	U	91	U	5	U	5	U	4.9	U	5	U	4.7	U	4.8	U
Chlorobenzene	1,600,000	130,000	1,000	**			90	U	85	U	77	U	5	U	100	U	4.5	U	4.9	U	5.2	U	91	U	5	U	5	U	4.9	U	5	U	4.7	U	4.8	U
Chloroethane	NL	NL	NL	NL	NL	NL	90	U	85	U	77	U	5	U	100	U	4.5	U	4.9	U	5.2	U	91	U	5	U	5	U	4.9	U	5	U	4.7	U	4.8	U
Chloroform	100,000	300	600	**			90	U	85	U	77	U	5	U	100	U	4.5	U	4.9	U	5.2	U	91	U	5	U	5	U	4.9	U	5	U	4.7	U	4.8	U
Chloromethane	NL	NL	NL	NL	NL	NL	90	U	85	U	77	U	5	U	100	U	4.5	U	4.9	U	5.2	U	91	U	5	U	5	U	4.9	U	5	U	4.7	U	4.8	U
cis-1,3-Dichloropropene	NL	NL	NL	NL	NL	NL	90	U	85	U	77	U	5	U	100	U	4.5	U	4.9	U	5.2	U	91	U	5	U	5	U	4.9	U	5	U	4.7	U	4.8	U
Ethylbenzene	7,800,000	400,000	13,000	**			23	U	21	U	18	U	5	U	25	U	4.5	U	4.9	U	5.2	U	23	U	5	U	5	U	4.9	U	5	U	4.7	U	4.8	U
Methylene chloride	85,000	13,000	20	**			90	U	85	U	77	U	13		100	U	5.5		4.9		11		91	U	5	U	12		7.2		5	U	4.7	U	6.6	
Styrene	16,000,000	1,500,000	4,000	**			90	U	85	U	77	U	5	U	100	U	4.5	U	4.9	U	5.2	U	91	U	5	U	5	U	4.9	U	5	U	4.7	U	4.8	U
Tetrachloroethene	12,000	11,000	60	**			1,700		8,100		2,500		930		1,600		100		120		170		1,100		890		68		45		58		51		55	
Toluene	16,000,000	650,000	12,000	**			23	U	21	U	19	U	5	U	25	U	4.5	U	4.9	U	5.2	U	23	U	5	U	5	U	4.9	U	5	U	4.7	U	4.8	U
trans-1,3-Dichloropropene	NL	NL	NL	NL	NL	NL	90	U	85	U	77	U	5	U	100	U	4.5	U	4.9	U	5.2	U	91	U	5	U	5	U	4.9	U	5	U	4.7	U	4.8	U
Trichloroethene	58,000	5,000	60	**			90	U	190		77	U	5.7		100	U	5.7		5.8		8.2		67	Ja	54		5	U	4.9	U	5	U	4.7	U	4.8	U
Vinyl chloride	460	280	10	**			90	U	85	U	77	U	5	U	100	U	4.5	U	4.9	U	5.2	U	91	U	5	U	5	U	4.9	U	5	U	4.7	U	4.8	U
Xylenes (total)	160,000,000	320,000	150,000	**			68	U	64	U	57	U	5	U	76	U	4.5	U	4.9	U	5.2	U	68	U	5	U	5	U	4.9	U	5	U	4.7	U	4.8	U
DRO/JP-4							5,100	U	4,900	U	4,400	U	4,300	U	4,300	Ua	4,200	U	4,300	U	4,300	Ua	4,600	U	5,000	U	4,300	U	4,200	U	4,500	U	4,300	U	4,200	U

See endnotes for analytical qualifier explanation.

Appendix B
SOIL ANALYTICAL RESULTS – OUTSIDE CONTAINER STORAGE AREA (OSA)
(S1-S8) – VOCs, DRO/JP-4, and RCRA METALS
AREA 9/10
SER GROUNDWATER CONTAMINATION SUPERFUND SITE
ROCKFORD, IL
S6

SECOR

Analyte	ROD - Preliminary Remediation Goals and/or Section 742 Table A: Tier 1 Soil Remediation Objectives for Residential Properties				Location Depth Sample Date	SB-S6 0-2'	SB-S6 2-4'	SB-S6 4-6'	SB-S6 6-8'	SB-S6 8-10'	SB-S6 10-12'	SB-S6 12-14'	SB-S6 14-16'	SB-S6 16-18'	SB-S6 18-20'	SB-S6 20-22'	SB-S6 22-24'	SB-S6 24-26'	SB-S6 26-28'	SB-S6 28-30'	SB-S6 30-32'
	Soil Ingestion (ug/kg)	Soil Inhalation (ug/kg)	Soil Component of Groundwater Class 1 (ug/kg)	ADL (ug/kg)		Units		ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg
						RES	Q														
1,1,1-Trichloroethane	NL	1,200,000	2,000	**		11	67	77	8	7.4	15	18	11	21	12	7.5	7.9	8.8	13	9.9	8.3
1,1,2,2-Tetrachloroethane	NL	NL	NL	NL		5 U	4.7 U	4.4 U	5.2 U	5 U	4.9 U	4.4 U	5.1 U	5 U	5.6 U	5 U	5.3 U	5 U	5.4 U	4.2 U	5.1 U
1,1,2-Trichloroethane	310,000	1,800,000	20	**		5 U	4.7 U	4.4 U	5.2 U	5 U	4.9 U	4.4 U	5.1 U	5 U	5.6 U	5 U	5.3 U	5 U	5.4 U	4.2 U	5.1 U
1,1-Dichloroethane	7,800,000	1,300,000	23,000	**		5 U	4.7 U	4.4 U	5.2 U	5 U	4.9 U	4.4 U	5.1 U	5 U	5.6 U	5 U	5.3 U	5 U	5.4 U	4.2 U	5.1 U
1,1-Dichloroethene	700,000	1,500,000	60	**		5 U	4.7 U	4.4 U	5.2 U	5 U	4.9 U	4.4 U	5.1 U	5 U	5.6 U	5 U	5.3 U	5 U	5.4 U	4.2 U	5.1 U
1,2-Dichloroethane	7,000	400	20	**		5 U	4.7 U	4.4 U	5.2 U	5 U	4.9 U	4.4 U	5.1 U	5 U	5.6 U	5 U	5.3 U	5 U	5.4 U	4.2 U	5.1 U
1,2-Dichloroethane (total)	NL	NL	NL	NL		5 U	4.7 U	4.4 U	5.2 U	5 U	4.9 U	4.4 U	5.1 U	5 U	5.6 U	5 U	5.3 U	5 U	5.4 U	4.2 U	5.1 U
1,2-Dichloropropane	9,000	15,000	30	**		5 U	4.7 U	4.4 U	5.2 U	5 U	4.9 U	4.4 U	5.1 U	5 U	5.6 U	5 U	5.3 U	5 U	5.4 U	4.2 U	5.1 U
2-Butanone (MEK)	NL	NL	NL	NL		5 U	4.7 U	4.4 U	5.2 U	5 U	4.9 U	4.4 U	5.1 U	5 U	5.6 U	5 U	5.3 U	5 U	5.4 U	4.2 U	5.1 U
2-Hexanone	NL	NL	NL	NL		5 U	4.7 U	4.4 U	5.2 U	5 U	4.9 U	4.4 U	5.1 U	5 U	5.6 U	5 U	5.3 U	5 U	5.4 U	4.2 U	5.1 U
4-Methyl-2-pentanone (MIBK)	NL	NL	NL	NL		5 U	4.7 U	4.4 U	5.2 U	5 U	4.9 U	4.4 U	5.1 U	5 U	5.6 U	5 U	5.3 U	5 U	5.4 U	4.2 U	5.1 U
Acetone	7,800,000	100,000,000	16,000	**		49	4.7	59	43	34	23	34	19	27	28	16	24	26	22	25	
Benzene	12,000	800	30	**		5 U	4.7 U	4.4 U	5.2 U	5 U	4.9 U	4.4 U	5.1 U	5 U	5.6 U	5 U	5.3 U	5 U	5.4 U	4.2 U	5.1 U
Bromodichloromethane	10,000	3,000,000	600	**		5 U	4.7 U	4.4 U	5.2 U	5 U	4.9 U	4.4 U	5.1 U	5 U	5.6 U	5 U	5.3 U	5 U	5.4 U	4.2 U	5.1 U
Bromoform	81,000	53,000	800	**		5 U	4.7 U	4.4 U	5.2 U	5 U	4.9 U	4.4 U	5.1 U	5 U	5.6 U	5 U	5.3 U	5 U	5.4 U	4.2 U	5.1 U
Bromomethane	110,000	10,000	200	**		5 U	4.7 U	4.4 U	5.2 U	5 U	4.9 U	4.4 U	5.1 U	5 U	5.6 U	5 U	5.3 U	5 U	5.4 U	4.2 U	5.1 U
Carbon disulfide	7,800,000	720,000	32,000	**		5 U	4.7 U	4.4 U	5.2 U	5 U	4.9 U	4.4 U	5.1 U	5 U	5.6 U	5 U	5.3 U	5 U	5.4 U	4.2 U	5.1 U
Carbon tetrachloride	5,000	300	70	**		5 U	4.7 U	4.4 U	5.2 U	5 U	4.9 U	4.4 U	5.1 U	5 U	5.6 U	5 U	5.3 U	5 U	5.4 U	4.2 U	5.1 U
Chlorobenzene	1,600,000	130,000	1,000	**		5 U	4.7 U	4.4 U	5.2 U	5 U	4.9 U	4.4 U	5.1 U	5 U	5.6 U	5 U	5.3 U	5 U	5.4 U	4.2 U	5.1 U
Chloroethane	NL	NL	NL	NL		5 U	4.7 U	4.4 U	5.2 U	5 U	4.9 U	4.4 U	5.1 U	5 U	5.6 U	5 U	5.3 U	5 U	5.4 U	4.2 U	5.1 U
Chloroform	100,000	300	600	**		5 U	4.7 U	4.4 U	5.2 U	5 U	4.9 U	4.4 U	5.1 U	5 U	5.6 U	5 U	5.3 U	5 U	5.4 U	4.2 U	5.1 U
Chloromethane	NL	NL	NL	NL		5 U	4.7 U	4.4 U	5.2 U	5 U	4.9 U	4.4 U	5.1 U	5 U	5.6 U	5 U	5.3 U	5 U	5.4 U	4.2 U	5.1 U
cis-1,3-Dichloropropene	NL	NL	NL	NL		5 U	4.7 U	4.4 U	5.2 U	5 U	4.9 U	4.4 U	5.1 U	5 U	5.6 U	5 U	5.3 U	5 U	5.4 U	4.2 U	5.1 U
Ethylbenzene	7,800,000	400,000	13,000	**		5 U	4.7 U	4.4 U	5.2 U	5 U	4.9 U	4.4 U	5.1 U	5 U	5.6 U	5 U	5.3 U	5 U	5.4 U	4.2 U	5.1 U
Methylene chloride	85,000	13,000	20	**		5 U	4.7 U	4.4 U	5.2 U	5 U	4.9 U	4.4 U	5.1 U	5 U	5.6 U	5 U	5.3 U	5 U	5.4 U	4.2 U	5.1 U
Styrene	16,000,000	1,500,000	4,000	**		5 U	4.7 U	4.4 U	5.2 U	5 U	4.9 U	4.4 U	5.1 U	5 U	5.6 U	5 U	5.3 U	5 U	5.4 U	4.2 U	5.1 U
Tetrachloroethane	12,000	11,000	60	**		44	140	80	8.8	13	21	21	20	41	24	20	19	21	30	19	22
Toluene	16,000,000	650,000	12,000	**		5 U	4.7 U	4.4 U	5.2 U	5 U	4.9 U	4.4 U	5.1 U	5 U	5.6 U	5 U	5.3 U	5 U	5.4 U	4.2 U	5.1 U
trans-1,3-Dichloropropene	NL	NL	NL	NL		5 U	4.7 U	4.4 U	5.2 U	5 U	4.9 U	4.4 U	5.1 U	5 U	5.6 U	5 U	5.3 U	5 U	5.4 U	4.2 U	5.1 U
Trichloroethene	58,000	5,000	60	**		5 U	4.7 U	4.4 U	5.2 U	5 U	4.9 U	4.4 U	5.1 U	5 U	5.6 U	5 U	5.3 U	5 U	5.4 U	4.2 U	5.1 U
Vinyl chloride	460	280	10	**		5 U	4.7 U	4.4 U	5.2 U	5 U	4.9 U	4.4 U	5.1 U	5 U	5.6 U	5 U	5.3 U	5 U	5.4 U	4.2 U	5.1 U
Xylenes (total)	160,000,000	320,000	150,000	**		5 U	4.7 U	4.4 U	5.2 U	5 U	4.9 U	4.4 U	5.1 U	5 U	5.6 U	5 U	5.3 U	5 U	5.4 U	4.2 U	5.1 U
DRO/JP-4						5,000 U*	5,000 U*	4,600 U*	4,400 U*	4,300 U*	4,300 U*	4,300 U*	4,200 U*	4,300 U*	4,700 U*	4,300 U*	4,400 U*	4,300 U*	4,300 U*	4,200 U*	4,200 U*
									</												

See endnotes for analytical qualifier explanation.

Appendix B
 SOIL ANALYTICAL RESULTS – OUTSIDE CONTAINER STORAGE AREA (OSA)
 (S1-S8) – VOCs, DRO/JP-4, and RCRA METALS
 AREA 9/10
 SER GROUNDWATER CONTAMINATION SUPERFUND SITE
 ROCKFORD, IL
 S7

SECOR

Analyte	ROD - Preliminary Remediation Goals and/or Section 742 Table A: Tier 1 Soil Remediation Objectives for Residential Properties				Location Depth Sample Date	SB-S7 2-4'	SBD-S7 2-4'	SB-S7 4-6'	SB-S7 6-8'	SB-S7 8-10'	SB-S7 10-12'	SB-S7 12-14'	SB-S7 14-18'	SB-S7 16-18'	SB-S7 18-20'	SB-S7 20-22'	SB-S7 22-24'	SB-S7 24-26'	SBD-S7 24-26'	SB-S7 26-28'	SB-S7 28-30'	SB-S7 30-32'																			
	Soil Ingestion (ug/kg)	Soil Inhalation (ug/kg)	Soil Component of Groundwater Class 1 (ug/kg)	ADL (ug/kg)		Units	RES	Q	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg																		
1,1,1-Trichloroethane	NL	1,200,000	2,000	**				12,000	4400	130	15	14	50	14	6.8	11	210	6.8	18	H	7.2	10	7.7	H	14	H	19	H													
1,1,2,2-Tetrachloroethane	NL	NL	NL	NL				95	U	110	U	5.8	U	4.7	U	5.3	U	5.3	U	5	U	5.2	U	5.3	U	5.4	U	5.2	U	5.4	U	5.3	U	5.2	U						
1,1,2-Trichloroethane	310,000	1,800,000	20	**				95	U	110	U	5.8	U	4.7	U	5.3	U	5.3	U	5	U	5.2	U	5.3	U	5.4	U	5.2	U	5.4	U	5.3	U	5.2	U						
1,1-Dichloroethane	7,800,000	1,300,000	23,000	**				370		130	20	4.7	U	5.3	U	5.4	5	U	5.2	U	5.3	U	48	5.2	U	5.5	U	5.3	U	5.2	U	5.4	U	5.3	U	5.2	U				
1,1-Dichloroethene	700,000	1,500,000	60	**				95	U	110	U	5.8	U	4.7	U	5.3	U	5.3	U	5	U	5.2	U	5.3	U	5.4	U	5.2	U	5.5	U	5.3	U	5.2	U	5.4	U	5.2	U		
1,2-Dichloroethane	7,000	400	20	**				95	U	110	U	5.8	U*	4.7	U*	5.3	U*	5.3	U*	5	U	5.2	U*	5.3	U*	5.4	U	5.2	U*	5.5	U	5.3	U*	5.2	U*	5.4	U	5.3	U	5.2	U
1,2-Dichloroethane (total)	NL	NL	NL	NL				270		94	J	23	3.3	Ja	5.3	U	8.3	5	U	5.2	U	5.3	U	52	5.2	U	5.5	U	5.3	U	5.2	U	5.4	U	5.3	U	5.2	U	5.8	Ja	
1,2-Dichloropropane	9,000	15,000	30	**				95	U	110	U	5.8	U	4.7	U	5.3	U	5.3	U	5	U	5.2	U	5.3	U	5.4	U	5.2	U	5.5	U	5.3	U	5.2	U	5.4	U	5.3	U	5.2	U
2-Butanone (MEK)	NL	NL	NL	NL				95	U	110	U	5.8	U*	4.7	U*	5.3	U*	5.3	U*	5	U	5.2	U*	5.3	U*	5.4	U	5.2	U*	5.5	U	5.3	U*	5.2	U*	5.4	U	5.3	U	5.2	U
2-Hexanone	NL	NL	NL	NL				95	U	110	U	5.8	U	4.7	U	5.3	U	5.3	U	5	U	5.2	U	5.3	U	5.4	U*	5.2	U	5.5	U*	5.3	U	5.2	U	5.4	U*	5.3	U*	5.2	U*
4-Methyl-2-pentanone (MIBK)	NL	NL	NL	NL				95	U	110	U	5.8	U*	4.7	U*	5.3	U*	5.3	U*	5	U	5.2	U*	5.3	U*	5.4	U*	5.2	U*	5.5	U*	4.3	U*	5.2	U*	5.4	U*	5.3	U*	5.2	U*
Acetone	7,800,000	100,000,000	16,000	**				95	U	110	U	71	*	44	*	36	*	26	*	10	5.2	U	5.3	U*	5.4	U	18	*	13	*	14	*	20	*	14	*	17	*	20	*	
Benzene	12,000	800	30	**				24	U	29	U	5.8	U	4.7	U	5.3	U	5.3	U	5	U	5.2	U	5.3	U	5.2	Ja	5.2	U	5.5	U	5.3	U	5.4	U	5.3	U	5.2	U	5.2	U
Bromodichloromethane	10,000	3,000,000	600	**				95	U	110	U	5.8	U*	4.7	U*	5.3	U*	5.3	U*	5	U	5.2	U*	5.3	U*	5.4	U	5.2	U*	5.5	U	5.3	U*	5.2	U*	5.4	U	5.3	U	5.2	U
Bromoform	81,000	53,000	800	**				95	U	110	U	5.8	U	4.7	U	5.3	U	5.3	U	5	U	5.2	U	5.3	U	5.4	U*	5.2	U	5.5	U*	5.3	U	5.2	U	5.4	U*	5.3	U	5.2	U
Bromomethane	110,000	10,000	200	**				95	U	110	U	5.8	U	4.7	U	5.3	U	5.3	U	5	U	5.2	U	5.3	U	5.4	U*	5.2	U	5.5	U*	5.3	U	5.2	U	5.4	U*	5.3	U	5.2	U
Carbon disulfide	7,800,000	720,000	32,000	**				95	U	110	U	5.8	U	4.7	U	5.3	U	5.3	U	5	U	5.2	U	5.3	U	5.4	U	5.2	U	5.5	U	5.3	U	5.2	U	5.4	U	5.3	U	5.2	U
Carbon tetrachloride	5,000	300	70	**				95	U	110	U	5.8	U	4.7	U	5.3	U	5.3	U	5	U	5.2	U	5.3	U	5.4	U	5.2	U	5.5	U	5.3	U	5.2	U	5.4	U	5.3	U	5.2	U
Chlorobenzene	1,600,000	130,000	1,000	**				95	U	110	U	5.8	U	4.7	U	5.3	U	5.3	U	5	U	5.2	U	5.3	U	5.4	U	5.2	U	5.5	U	5.3	U	5.2	U	5.4	U	5.3	U	5.2	U
Chloroethane	NL	NL	NL	NL				95	U	110	U	5.8	U*	4.7	U*	5.3	U*	5.3	U*	5	U	5.2	U*	5.3	U*	5.4	U	5.2	U*	5.5	U	5.3	U*	5.2	U*	5.4	U	5.3	U	5.2	U
Chloroform	100,000	300	600	**				95	U	110	U	5.8	U*	4.7	U*	5.3	U*	5.3	U*	5	U	5.2	U*	5.3	U*	5.4	U	5.2	U*	5.5	U	5.3	U*	5.2	U*	5.4	U	5.3	U	5.2	U
Chloromethane	NL	NL	NL	NL				95	U	110	U	5.8	U	4.7	U	5.3	U	5.3	U	5	U	5.2	U	5.3	U	5.4	U	5.2	U	5.5	U	5.3	U	5.2	U	5.4	U	5.3	U	5.2	U
cis-1,3-Dichloropropene	NL	NL	NL	NL				95	U	110	U	5.8	U	4.7	U	5.3	U	5.3	U	5	U	5.2	U	5.3	U	5.4	U	5.2	U	5.5	U	5.3	U	5.2	U	5.4	U	5.3	U	5.2	U
Ethylbenzene	7,800,000	400,000	13,000	**				24	U	29	U	5.8	U	4.7	U	5.3	U	5.3	U	5	U	5.2	U	5.3	U	5.4	U	5.2	U	5.5	U	5.3	U	5.2	U	5.4	U	5.3	U	5.2	U
Methylene chloride	85,000	13,000	20	**				95	U	110	U	5.8	U	4.7	U	5.3	U	5.3	U	5	U	5.2	U	11	5.4	U	5.2	U	5.5	U	5.3	U	5.2	U	5.4	U	5.3	U	5.2	U	
Styrene	16,000,000	1,500,000	4,000	**				95	U	110	U	5.8	U	4.7	U	5.3	U	5.3	U	5	U	5.2	U	5.3	U	5.4	U	5.2	U	5.5	U	5.3	U	5.2	U	5.4	U	5.3	U	5.2	U
Tetrachloroethene	12,000	11,000	60	**				49,000		17,000	84	18	28	60	34	30	47	590	18	42	25	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24		
Toluene	16,000,000	650,000	12,000	**				24	U	29	U	5.8	U	4.7	U	5.3	U	5.3	U	7.4	5.2	U	5.3	U	9.7	6.7	7.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	
trans-1,3-Dichloropropene	NL	NL	NL	NL				95	U	110	U	5.8	U	4.7	U	5.3	U	5.3	U	5	U	5.2	U	5.3	U	5.4	U	5.2	U	5.5	U	5.3	U	5.2	U	5.4	U	5.3	U	5.2	U
Trichloroethene	58,000	5,000	60	**				670		270	6	4.7	U	5.3	U	5.3	U	5.3	U	5	U	5.2	U	5.3	U	18	5.2	U	5.5	U	5.3	U	5.2	U	5.4	U	5.3	U	5.2	U	
Vinyl chloride	460	280	10	**				95	U	110	U	5.8	U	4.7	U	5.3	U	5.3	U	5	U	5.2	U	5.3	U	5.4	U	5.2	U	5.5	U	5.3	U	5.2	U	5.4	U	5.3	U	5.2	U
Xylenes (total)	160,000,000	320,000	150,000	**				71	U	86	U	5.8	U	4.7	U	5.3	U	5.3	U	5	U	5.2	U	5.3	U	5.4	U	5.2	U	5.5	U	5.3	U	5.2	U	5.4	U	5.3	U	5.2	U
DRO/JP-4								4,900	U	4,900	U	4,900	U	4,400	U	4,400	U	4,400	U	4,200	U	4,300	U	4,300	U	5,000	U	4,200	U	4,300	U	4,200	U	4,200	U	4,200	U	4,500	U	4,200	U
Arsenic,TCLP	50	50	50	U	10/30/2003	ug/L		50	U	50	U	50	U	50	U	50	U	50	U	50	U	50	U	50	U	50	U	50	U	50	U	50	U	50	U	50	U	50	U	50	U
Barium,TCLP	2,000	2,000	2,000	U	10/30/2003	ug/L		460	510	890	B	610	B	630	B	650	B	420	B	130	B	130	B	390	B	410	B	340	B	420	B	330	B	360	B	350	B	380	B		
Cadmium,TCLP	5	5	5	U	10/30/2003	ug/L		5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
Chromium,TCLP	100	100	100	U	10/30/2003	ug/L		50	U	50	U	50																													

Appendix B
SOIL ANALYTICAL RESULTS – OUTSIDE CONTAINER STORAGE AREA (OSA)
(S1-S8) – VOCs, DRO/JP-4, and RCRA METALS
AREA 9/10
SER GROUNDWATER CONTAMINATION SUPERFUND SITE
ROCKFORD, IL
S8

SECOR

Analyte	ROD - Preliminary Remediation Goals and/or Section 742 Table A: Tier 1 Soil Remediation Objectives for Residential Properties				Location Depth Sample Date	SB-S8 2-4'	SB-S8 4-6'	SB-S8 6-8'	SB-S8 8-10'	SBD-S8 8-10'	SB-S8 10-12'	SB-S8 12-14'	SB-S8 14-16'	SB-S8 16-18'	SB-S8 18-20'	SBD-S8 18-20'	SB-S8 20-22'	SB-S8 22-24'	SB-S8 24-26'	SB-S8 26-28'	SB-S8 28-30'	SB-S8 30-32'																			
	Soil Ingestion (ug/kg)	Soil Inhalation (ug/kg)	Soil Component of Groundwater Class 1 (ug/kg)	ADL		Units		ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg																			
						RES	Q																																		
1,1,1-Trichloroethane	NL	1,200,000	2,000	--			500	120	31		10	7.8	24		8.3	12	11	48		110	16	23		6.2	26		7.8		8.9												
1,1,2,2-Tetrachloroethane	NL	NL	NL	NL			92	U	4.7	U	4.5	U	5.1	U	4.8	U	4.3	U	4.9	U	5	U	5.2	U	5.5	U	4.6	U	4.1	U	5.2	U	5.3	U	4.9	U	5.1	U	5.2	U	
1,1,2-Trichloroethane	310,000	1,800,000	20	--			92	U	4.7	U	4.5	U	5.1	U	4.8	U	4.3	U	4.9	U	5	U	5.2	U	5.5	U	4.6	U	4.1	U	5.2	U	5.3	U	4.9	U	5.1	U	5.2	U	
1,1-Dichloroethane	7,800,000	1,300,000	23,000	--			92	U	13		3.9	Ja	5.1	U	4.8	U	4.3	U	4.9	U	5	U	5.2	U	5.5	U	4.6	U	3.9	Ja	5.2	U	5.3	U	2.9	Ja	5.1	U	5.2	U	
1,1-Dichloroethene	700,000	1,500,000	60	--			92	U	4.7	U	4.5	U	5.1	U	4.8	U	4.3	U	4.9	U	5	U	5.2	U	5.5	U	4.6	U	4.1	U	5.2	U	5.3	U	4.9	U	5.1	U	5.2	U	
1,2-Dichloroethane	7,000	400	20	--			92	U	4.7	U	4.5	U	5.1	U	4.8	U	4.3	U	4.9	U	5	U	5.2	U	5.5	U	4.6	U	4.1	U	5.2	U	5.3	U	4.9	U	5.1	U	5.2	U	
1,2-Dichloroethene (total)	NL	NL	NL	NL			92	U	21		8.8		5.1	U	4.8	U	4.3	U	4.9	U	5	U	5.2	U	5.5	U	4.6	U	7		3.2	Ja	5.3	U	6		5.1	U	5.2	U	
1,2-Dichloropropane	9,000	15,000	30	--			92	U	4.7	U	4.5	U	5.1	U	4.8	U	4.3	U	4.9	U	5	U	5.2	U	5.5	U	4.6	U	4.1	U	5.2	U	5.3	U	4.9	U	5.1	U	5.2	U	
2-Butanone (MEK)	NL	NL	NL	NL			92	U	5.3		4.8		5.1	U	4.8	U	4.3	U	4.9	U	5	U	5.2	U	5.5	U	4.6	U	4.1	U	5.2	U	5.3	U	4.9	U	5.1	U	5.2	U	
2-Hexanone	NL	NL	NL	NL			92	U	4.7	U	4.5	U	5.1	U	4.8	U	4.3	U	4.9	U	5	U	5.2	U	5.5	U	4.6	U	4.1	U	5.2	U	5.3	U	4.9	U	5.1	U	5.2	U	
4-Methyl-2-pentanone (MIBK)	NL	NL	NL	NL			92	U	4.7	U	4.5	U	5.1	U	4.8	U	4.3	U	4.9	U	5	U	5.2	U	5.5	U	4.6	U	4.1	U	5.2	U	5.3	U	4.9	U	5.1	U	5.2	U	
Acetone	7,800,000	100,000,000	16,000	--			92	U	59		30		5.1	U	4.8	U	4.3	U	4.9	U	5	U	5.2	U	5.5	U	4.6	U	4.1	U	5.2	U	5.3	U	4.9	U	5.1	U	5.2	U	
Benzene	12,000	800	30	--			23	U	4.7	U	4.5	U	5.1	U	4.8	U	4.3	U	4.9	U	5	U	5.2	U	5.5	U	3.0	J	4.1	U	5.2	U	5.3	U	4.9	U	5.1	U	5.2	U	
Bromodichloromethane	10,000	3,000,000	600	--			92	U	4.7	U	4.5	U	5.1	U	4.8	U	4.3	U	4.9	U	5	U	5.2	U	5.5	U	4.6	U	4.1	U	5.2	U	5.3	U	4.9	U	5.1	U	5.2	U	
Bromoform	81,000	53,000	800	--			92	U	4.7	U	4.5	U	5.1	U	4.8	U	4.3	U	4.9	U	5	U	5.2	U	5.5	U	4.6	U	4.1	U	5.2	U	5.3	U	4.9	U	5.1	U	5.2	U	
Bromomethane	110,000	10,000	200	--			92	U	4.7	U	4.5	U	5.1	U	4.8	U	4.3	U	4.9	U	5	U	5.2	U	5.5	U	4.6	U	4.1	U	5.2	U	5.3	U	4.9	U	5.1	U	5.2	U	
Carbon disulfide	7,800,000	720,000	32,000	--			92	U	4.7	U	4.5	U	5.1	U	4.8	U	4.3	U	4.9	U	5	U	5.2	U	5.5	U	4.6	U	4.1	U	5.2	U	5.3	U	4.9	U	5.1	U	5.2	U	
Carbon tetrachloride	5,000	300	70	--			92	U	4.7	U	4.5	U	5.1	U	4.8	U	4.3	U	4.9	U	5	U	5.2	U	5.5	U	4.6	U	4.1	U	5.2	U	5.3	U	4.9	U	5.1	U	5.2	U	
Chlorobenzene	1,600,000	130,000	1,000	--			92	U	4.7	U	4.5	U	5.1	U	4.8	U	4.3	U	4.9	U	5	U	5.2	U	5.5	U	4.6	U	4.1	U	5.2	U	5.3	U	4.9	U	5.1	U	5.2	U	
Chloroethane	NL	NL	NL	NL			92	U	4.7	U	4.5	U	5.1	U	4.8	U	4.3	U	4.9	U	5	U	5.2	U	5.5	U	4.6	U	4.1	U	5.2	U	5.3	U	4.9	U	5.1	U	5.2	U	
Chloroform	100,000	300	600	--			92	U	4.7	U	4.5	U	5.1	U	4.8	U	4.3	U	4.9	U	5	U	5.2	U	5.5	U	4.6	U	4.1	U	5.2	U	5.3	U	4.9	U	5.1	U	5.2	U	
Chloromethane	NL	NL	NL	NL			92	U	4.7	U	4.5	U	5.1	U	4.8	U	4.3	U	4.9	U	5	U	5.2	U	5.5	U	4.6	U	4.1	U	5.2	U	5.3	U	4.9	U	5.1	U	5.2	U	
cis-1,3-Dichloropropene	NL	NL	NL	NL			92	U	4.7	U	4.5	U	5.1	U	4.8	U	4.3	U	4.9	U	5	U	5.2	U	5.5	U	4.6	U	4.1	U	5.2	U	5.3	U	4.9	U	5.1	U	5.2	U	
Ethylbenzene	7,800,000	400,000	13,000	--			23	U	4.7	U	4.5	U	5.1	U	4.8	U	4.3	U	4.9	U	5	U	5.2	U	5.5	U	4.6	U	4.1	U	5.2	U	5.3	U	4.9	U	5.1	U	5.2	U	
Methylene chloride	85,000	13,000	20	--			92	U	4.7	U	4.5	U	5.1	U	4.8	U	4.3	U	4.9	U	5	U	5.2	U	5.5	U	4.6	U	4.1	U	5.2	U	5.3	U	4.9	U	5.1	U	5.2	U	
Styrene	16,000,000	1,500,000	4,000	--			92	U	4.7	U	4.5	U	5.1	U	4.8	U	4.3	U	4.9	U	5	U	5.2	U	5.5	U	4.6	U	4.1	U	5.2	U	5.3	U	4.9	U	5.1	U	5.2	U	
Tetrachloroethene	12,000	11,000	60	--			2,800		150		39		38		29		57		32		53		46		110		630		45		72		25		65		30		33		
Toluene	16,000,000	650,000	12,000	--			23	U	4.7	U	4.5	U	5.1	U	4.8	U	4.3	U	4.9	U	5	U	5.2	U	5.5	U	4.6	U	4.1	U	5.2	U	5.3	U	4.9	U	5.1	U	5.2	U	
trans-1,3-Dichloropropene	NL	NL	NL	NL			92	U	4.7	U	4.5	U	5.1	U	4.8	U	4.3	U	4.9	U	5	U	5.2	U	5.5	U	4.6	U	4.1	U	5.2	U	5.3	U	4.9	U	5.1	U	5.2	U	
Trichloroethene	58,000	5,000	60	--			110		12		3	Ja	5.1	U	4.8	U	3.9	Ja	4.9	U	5	U	5.2	U	7.2		13		2.7	Ja	3.7	Ja	5.3	U	4.2	Ja	5.1	U	5.2	U	
Vinyl chloride	460	280	10	--			92	U	4.7	U	4.5	U	5.1	U	4.8	U	4.3	U	4.9	U	5	U	5.2	U	5.5	U	4.6	U	4.1	U	5.2	U	5.3	U	4.9	U	5.1	U	5.2	U	
Xylenes (total)	160,000,000	320,000	150,000	--			69	U	4.7	U	4.5	U	5.1	U	4.8	U	4.3	U	4.9	U	5	U	5.2	U	5.5	U	4.6	U	4.1	U	5.2	U	5.3	U	4.9	U	5.1	U	5.2	U	
DRO/JP-4								5,000	U	4,800	U	4,700	U	4,200	U	4,300	U	4,400	U	4,300	U	4,300	U	4,300	U	5,000	U	4,200	U	4,200	U	4,300	U	4,400	U	4,300	U	4,400	U	4,200	U
Arsenic,TCLP	50	50	50	50	10/30/2003			50	U	50	U	50	U	50	U	50	U	50	U	50	U	50	U	50	U	50	U	50	U	50	U	50	U	50	U	50	U	50	U	50	U
Barium,TCLP	2,000	2,000	2,000	2,000	10/30/2003			380	B	890	B	620	B	390	B	430	B	390	B	530	B	200	B	410	B	390	B	350	B	140	B	440	B	410	B	390	B	380	B	460	B
Cadmium,TCLP	5	5	5	5	10/30/2003			20	U	12		4	B	5	U	5	U	5	U	5	U	4	B	5	U	47		5	U	5	U	5	U	5	U	5	U	5	U	5	U
Chromium,TCLP	100	1																																							

Appendix B
SOIL ANALYTICAL RESULTS – OUTSIDE CONTAINER STORAGE AREA (OSA)
(S1-S8) – VOCs, DRO/JP-4, and RCRA METALS
AREA 9/10
SER GROUNDWATER CONTAMINATION SUPERFUND SITE
ROCKFORD, IL
ENDNOTES

SECOR

Analytical Table Notes:

Sample Collection Method

SB - Soil Boring

GW - Groundwater

General Abbreviations and Symbols

NL - Not Listed

Res - Result or Reporting Limit

RO - Remediation Objective

Q - Qualifier

** - Less than or equal to specified RO

Data Presentation

0.005	U	Not detected at specified Reporting Limit
0.005	U	(Bold) Detection limit above lowest specified RO
<i>0.005</i>		(Bold, Italic) Indicates compound detected but below lowest specified RO
<i>0.005</i>		(Bold, Italic, Shaded) Indicates compound detected above lowest specified RO
		(Blank) Indicates no analytical data for compound

Analytical Data Qualifiers

B - (Metals) Results less than reporting limit but greater than or equal to Method Detection Limit

E - Result exceeds calibration range, secondary dilution required

U - Not Detected

J - Estimated value below the Reporting Limit

a - Concentration is below the Method Reporting Limit

* - Batch QC exceeded the upper or lower control limits

H - Result based on an alternative peak selection upon analytical review

M - Manually Integrated Compound

- Concentration above Background Level but below lowest RO

APPENDIX C

**HRC-X Product Information &
Calculation Spreadsheet**



HRC-X™

HYDROGEN RELEASE
COMPOUND

[eXtended release formula]

HYDROGEN RELEASE COMPOUND (HRC-X™)

[eXtended release formula]

HRC-X is specifically formulated to treat residual DNAPL in groundwater and to provide a long term solution for groundwater contaminant plume control

How it Works

HRC-X is a special formulation of the patented and widely accepted Hydrogen Release Compound (HRC®), which has been successfully applied on hundreds of project sites world-wide for the cost-effective, *in-situ* treatment of groundwater contamination.

HRC-X is a viscous material, composed of glycerol polylactate, which is injected directly into the contaminated subsurface. Once in place, and in the vast majority of cases, HRC-X produces reducing conditions for periods of at least 3 to 5 years. These conditions are created and sustained as a result of lactic acid and ultimately hydrogen, that is released from HRC-X. This hydrogen, in turn, is used by microbes to degrade chlorinated solvent-type contaminants through a well understood process known as reductive dechlorination.

HRC-X can be used to degrade a range of contaminants including: degreasing agents (PCE, TCE, TCA and their breakdown products), carbon tetrachloride, chloroform, perchlorate, nitrate, and certain pesticides/herbicides.

Residual DNAPL Treatment

Residual Dense Non-Aqueous Phase Liquids (DNAPL's) are often difficult to find and very costly to treat. Residual DNAPL causes a lingering and unwanted source of groundwater contamination that can represent enormous and unexpected cleanup costs.

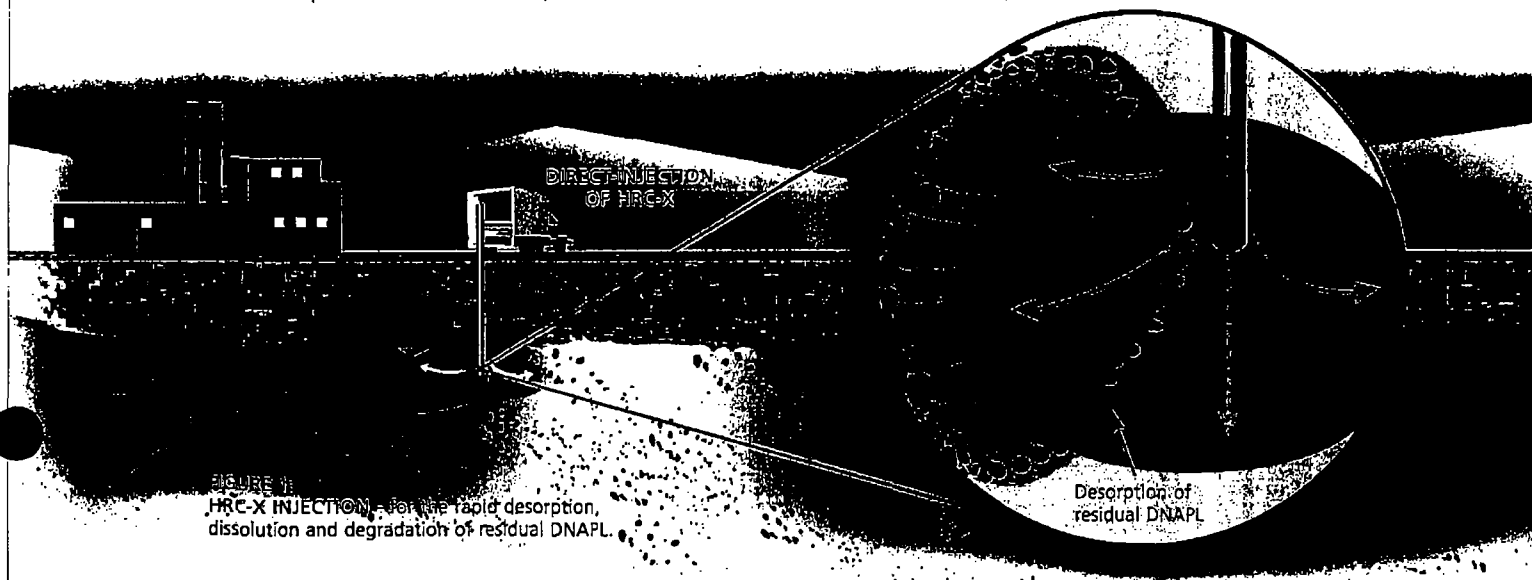
HRC-X is a proven solution to this challenging problem. Once injected into the general vicinity of the residual DNAPL, HRC-X goes to work releasing lactic acid and cost effectively producing the desired hydrogen throughout the area. This, in turn, drives the rapid desorption, dissolution, and degradation of the bound residual DNAPL (Figure 1).

Since HRC-X facilitates a microbial driven process, it can be applied without the need to identify the exact location of the residual DNAPL, avoiding costs associated with detailed site analysis. Additionally, HRC-X does not require stationary equipment, any on-going power supply, piping, long-term operations and maintenance or labor costs. These characteristics alone can significantly reduce the costs of residual DNAPL remediation.

Long Term, Low Cost Plume Control

When long-term plume control is required to halt the migration of groundwater contaminants, HRC-X may be one of the most cost effective alternatives available. In the past, the only alternative in these situations was to cut-off the plume by intercepting the groundwater with very inefficient and costly pump and treat systems, or by disruptive construction of expensive sheet pile barriers and "iron filing walls."

Groundwater remediation professionals now have an effective alternative to offer their clients and to reduce their cost burden, HRC-X. When applied perpendicular to the migrating plume, HRC-X passively releases the hydrogen required to degrade the mobile contaminant flux. The HRC-X material, once installed, continues to release hydrogen, effectively "cutting off" the migrating plume for a period in excess of 3 years, while avoiding the capital costs associated with engineering, construction and O&M intensive systems.





HRC Design Software for Plume Area/Grid Treatment

Page 1 of 2

Regenesi Technical Support: USA (949) 366-8000, www.regenesis.com

Site Name:

Location:

Consultant:

Site Conceptual Model/Extent of Plume Requiring Remediation

Width of plume (intersecting gw flow direction)

Length of plume (parallel to gw flow direction)

Depth to contaminated zone

Thickness of contaminated saturated zone

Nominal aquifer soil (gravel, sand, silty sand, silt, clay)

Total porosity

Hydraulic conductivity

Hydraulic gradient

Seepage velocity

Treatment Zone Pore Volume

0	ft		
0	ft	=	-
0	ft		
0	ft		
sand			
0		Eff. porosity:	0
0	ft/day	=	0.0E+00
0	ft/ft		
#DIV/0!	ft/yr	=	#DIV/0!
-	ft ³	=	-

Dissolved Phase Electron Donor Demand

Tetrachloroethene (PCE)

Trichloroethene (TCE)

cis-1,2-dichloroethene (DCE)

Vinyl Chloride (VC)

Carbon tetrachloride

Chloroform

1,1,1-Trichloroethane (TCA)

1,1-Dichlorochloroethane (DCA)

Hexavalent Chromium

User added, also add stoichiometric demand

User added, also add stoichiometric demand

Contaminant	Stoich. (wt/wt)
Conc (mg/L)	Mass (lb)
0.00	0.0
0.00	0.0
0.00	0.0
0.00	0.0
0.00	0.0
0.00	0.0
0.00	0.0
0.00	0.0
0.00	0.0
0.00	0.0
0.00	0.0
0.00	0.0
0.00	0.0
0.00	0.0

Sorbed Phase Electron Donor Demand

Soil bulk density

Fraction of organic carbon: foc

1.76	g/cm ³	=	110
0.01	range: 0.0001 to 0.01		

(Values are estimated using Soil Conc=foc*Koc*Cgw)

(Adjust Koc as nec. to provide realistic estimates)

Tetrachloroethene (PCE)

Trichloroethene (TCE)

cis-1,2-dichloroethene (DCE)

Vinyl Chloride (VC)

Carbon tetrachloride

Chloroform

1,1,1-Trichloroethane (TCA)

1,1-Dichlorochloroethane (DCA)

User added, also add stoichiometric demand

User added, also add stoichiometric demand

Koc	Contaminant	Stoich. (wt/wt)
(L/kg)	Conc (mg/kg)	Mass (lb)
263	0.00	0.0
107	0.00	0.0
80	0.00	0.0
2.5	0.00	0.0
110	0.00	0.0
34	0.00	0.0
183	0.00	0.0
183	0.00	0.0
0	0.00	0.0
0	0.00	0.0

Competing Electron Acceptors

Oxygen

Nitrate

Est. Mn reduction demand (potential amt of Mn²⁺ formed)Est. Fe reduction demand (potential amt of Fe²⁺ formed)

Estimated sulfate reduction demand

Electron Acceptor	Stoich. (wt/wt)
Conc (mg/L)	Mass (lb)
5.00	0
5.00	0
5.00	0
25.00	0
200.00	0

Microbial Demand Factor

Safety Factor

3	Recommend 1-4x
2	Recommend 1-4x

Injection Point Spacing and Dose:

Injection spacing within rows (ft)

Injection spacing between rows (ft)

Advective travel time bet. rows (days)

10.0	# points per row:	0
10.0	# of rows:	0
#DIV/0!	Total # of points:	0
Minimum req. HRC dose per foot (lb/ft)		#DIV/0!

PSC-Lester Property calcs-pentachlorophenol- 2sm0405-04h

7/23/04

Project Summary		
Number of HRC delivery points (adjust as nec. for site)	0	
HRC Dose in lb/foot (adjust as nec. for site)	#DIV/0!	#DIV/0!
Corresponding amount of HRC per point (lb)	#DIV/0!	
Number of 30 lb HRC Buckets per injection point	#DIV/0!	
Total Number of 30 lb Buckets	#DIV/0!	
Total Amt of HRC (lb)	#DIV/0!	
HRC Cost	#DIV/0!	#DIV/0!
Total Material Cost	#DIV/0!	#DIV/0!
Shipping and Tax Estimates in US Dollars		
Sales Tax	rate: 0%	#DIV/0!
Total Matl. Cost		#DIV/0!
Shipping of HRC (call for amount)	\$	-
Total Regensis Material Cost	#DIV/0!	

APPENDIX H

Visual Sample Plan Output

25' hotspot with 90% probability of detection
 = 46-50 samples

Systematic sampling locations for detecting an area of elevated values (hot spot)

This report summarizes the sampling design used, associated statistical assumptions, as well as general guidelines for conducting post-sampling data analysis. Sampling plan components presented here include how many sampling locations to choose and where within the sampling area to collect those samples. The type of medium to sample (i.e., soil, groundwater, etc.) and how to analyze the samples (in-situ, fixed laboratory, etc.) are addressed in other sections of the sampling plan.

The following table summarizes the sampling design developed. A figure that shows sampling locations in the field and a table that lists sampling location coordinates are also provided below.

SUMMARY OF SAMPLING DESIGN	
Primary Objective of Design	Detect the presence of a hot spot that has a specified size and shape
Type of Sampling Design	Hot spot
Sample Placement (Location) in the Field	Systematic (Hot Spot) with a random start location
Formula for calculating number of sampling locations	Singer and Wickman algorithm
Calculated total number of samples	46
Type of samples	Point Samples
Number of samples on map ^a	50
Number of selected sample areas ^b	1
Specified sampling area ^c	99722.69 ft ²
Grid pattern	Triangular
Size of grid / Area of grid ^d	50.1913 feet / 2181.66 ft ²
Total cost of sampling ^e	\$46.00

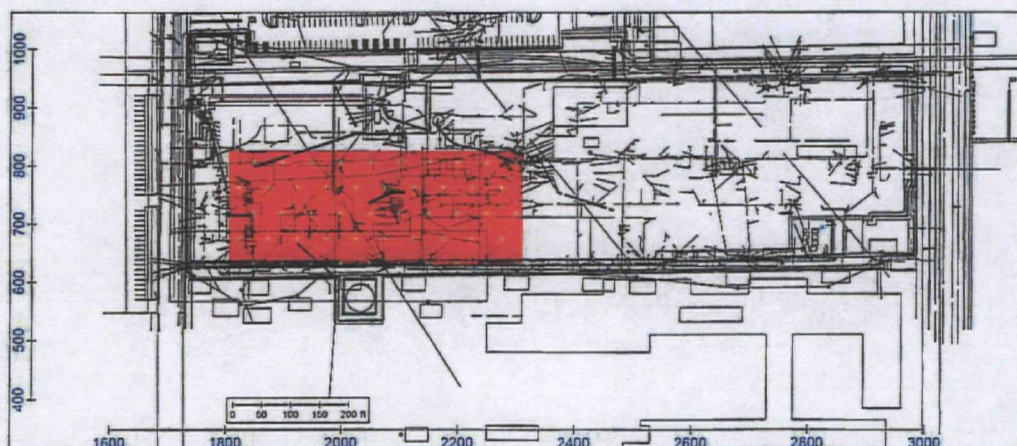
^a This number may differ from the calculated number because of 1) grid edge effects, 2) adding judgment samples, or 3) selecting or unselecting sample areas.

^b The number of selected sample areas is the number of colored areas on the map of the site. These sample areas contain the locations where samples are collected.

^c The sampling area is the total surface area of the selected colored sample areas on the map of the site.

^d Size of grid / Area of grid gives the linear and square dimensions of the grid spacing used to systematically place samples.

^e Including measurement analyses and fixed overhead costs. See the Cost of Sampling section for an explanation of the costs presented here.



2273.9189	762.9773	Hotspot
1847.2930	806.4442	Hotspot
1897.4842	806.4442	Hotspot
1947.6755	806.4442	Hotspot
1997.8668	806.4442	Hotspot
2048.0581	806.4442	Hotspot
2098.2494	806.4442	Hotspot
2148.4407	806.4442	Hotspot
2198.6320	806.4442	Hotspot
2248.8233	806.4442	Hotspot
2299.0146	806.4442	Hotspot

Primary Sampling Objective

The primary purpose of sampling at this site is to detect "hot spots" (local areas of elevated concentration) of a given size and shape with a specified probability, 1- α .

Selected Sampling Approach

This sampling approach requires systematic grid sampling with a random start. If a systematic grid is not used, the probability of detecting a hot spot of a given size and shape will be different than desired or calculated.

Number of Total Samples: Calculation Equation and Inputs

The algorithm used to calculate the grid size (and hence, the number of samples) is based on work by Singer for locating geologic deposits [see Singer (1972, 1975) and PNNL-13450 for details]. Inputs to the algorithm include the size, shape, and orientation of a hot spot of interest, an acceptable probability of not finding a hot spot, the desired type of sampling grid, and the sampling budget. For this design, the grid size was calculated based on a given hot spot size and other parameters.

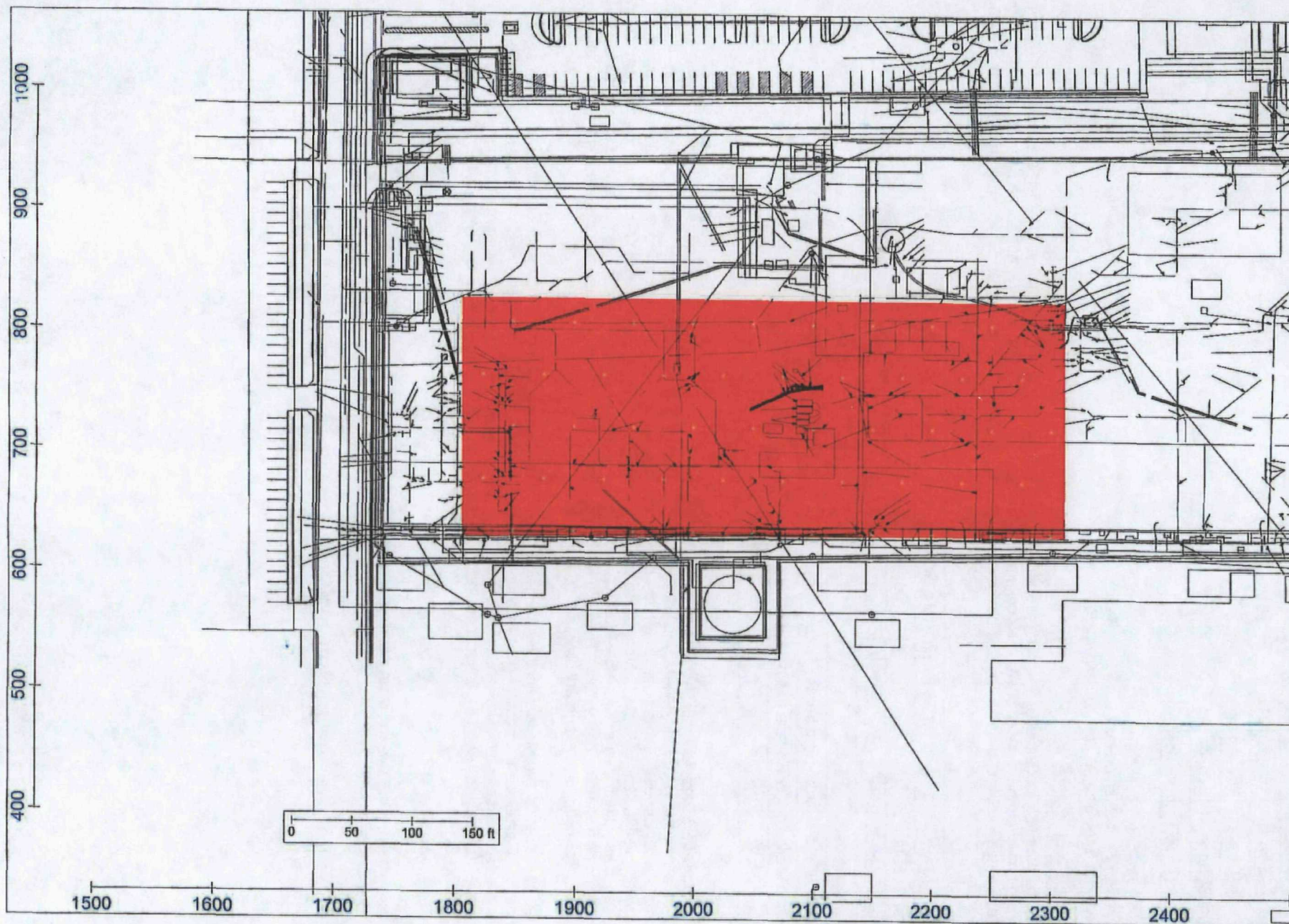
The inputs to the algorithm that result in the grid size are:

Parameter	Description	Value
Inputs		
1- α	Probability of detection	90%
Grid Type	Grid pattern (Square, Triangular or Rectangular)	Triangular
Sample Type	Point samples or square cells	Points
Hot Spot Shape	Hot spot height to width ratio	1
Hot Spot Size	Length of hot spot semi-major axis	25 feet
Hot Spot Area ^a	Area of hot spot (Length ² * Shape * π)	1963.5 ft ²
Angle	Angle of orientation between hot spot and grid	Random
Sampling Area	Total area to sample	99722.69 ft ²
Outputs		
Grid Size	Spacing between samples	50.1913 feet
Grid Area	Area represented by one grid	2181.66 ft ²
Samples ^b	Optimum number of samples	45.7095
Cost	Total cost of sampling	\$46.00

^a Length of semi-major axis is used by algorithm. Hot spot area is provided for informational purposes.

^b The optimum number of samples is calculated by dividing the sampling area by the grid area.

The following graph shows the relationship between number of samples and the probability of finding the hot spot. The



APPENDIX I

Groundwater Monitoring Plan



Groundwater Monitoring Plan

**STANTEC CONSULTING,
REMEDIAL ACTION SUPERVISING CONTRACTOR**

**FOR:
HAMILTON SUNDSTRAND
AREA 9/10 SOUTHEAST ROCKFORD GROUNDWATER
CONTAMINATION SUPERFUND SITE**

ROCKFORD, ILLINOIS

SEPTEMBER 2008

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Figure 2	Area 9/10 Monitoring Well Network
Figure 3	OSA wells

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Table 1	Natural Attenuation Parameters and Analytical Methods
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Appendices

Appendix A	Microseep Sampling Procedure
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List of Acronyms

1,1,1-TCA – 1,1,1 Trichloroethane
1,1,2-TCA – 1,1,2 Trichloroethane
1,1-DCE – 1,1 Dichloroethene
1,2-DCA – 1,2 Dichloroethane
1,2-DCE – 1,2 Dichloroethene
AOC – Administrative Order on Consent
AS – Air Sparge
bgs – below ground surface
CDM – Camp Dresser McKee
cm/sec – centimeters per second
COC – Constituents of Concern
DTW – Depth to Water
DO – Dissolved Oxygen
Facility – Hamilton Sundstrand Plant #1
FSP – Field Sampling Plan
GMP – Groundwater Monitoring Plan
GMZ – Groundwater Management Zone
HRC-X[®] - Hydrogen Release Compound-X
HS – Hamilton Sundstrand Corporation
IAC – Illinois Administrative Code
IEPA – Illinois Environmental Protection Agency
MCL – Maximum Contaminant Level
MNA – Monitored Natural Attenuation
ORP – Oxygen Reduction Potential
OSA – Outside Container Storage Area
OU – Operable Unit
PCE – Tetrachloroethene
PDI – Pre-Design Investigation
PRGs – Preliminary Remediation Goals
QAPP – Quality Assurance Plan
QA/QC – Quality Assurance/ Quality Control
RA – Remedial Action
RAWP – Remedial Action Work Plan
RI – Remedial Investigation
ROD – Record of Decision
SER – Southeast Rockford
SVE – Soil Vapor Extraction
TACO – Tiered Approach to Corrective Action Objectives
TCE – Trichloroethene
TD – Total Depth
TOC – Total Organic Carbon
USEPA – United States Environmental Protection Agency
VC – Vinyl Chloride
VOCs – Volatile Organic Compound(s)

1.0 INTRODUCTION

This Groundwater Monitoring Plan (GMP) pertains to the Remedial Action Area 9/10 of the Southeast Rockford (SER) Groundwater Contamination Superfund Site (CERCLIS ID No. ILD981000417) located in the City of Rockford, Winnebago County, Illinois.

Hamilton Sundstrand Corporation (HS) entered into an Administrative Order on Consent (AOC) with the United States Environmental Protection Agency (USEPA) and Illinois Environmental Protection Agency (IEPA) [collectively referred to as the Agencies] for the completion of a Remedial Action (RA) for source control in Area 9/10 on September 2, 2008. The establishment of a Groundwater Management Zone (GMZ) for Area 9/10 was identified as requirement as part of the Source Control Record of Decision (ROD) for Operable Unit Three (OU-3) which was dated May 2002. A GMZ was established for the HS Plant #1 (the Facility) within Area 9/10 in an approval letter from the IEPA dated May 16, 2008.

1.1 Site Description

Area 9/10 is an industrial area located within the City of Rockford, Winnebago County, Illinois. Area 9/10 is bound by Eleventh Street to the east, Twenty-Third Avenue to the north, Harrison Avenue to the south, and Sixth Street to the west. Hamilton Sundstrand Corporation was the only potentially responsible party identified by the IEPA for Area 9/10. The Facility is located within Area 9/10. Area 9/10 and HS Site locations are shown on Figure 1. Please refer to the Remedial Action Work Plan (RAWP) for additional site description and operable unit (OU) details.

1.2 HS Plant #1 Facility Constituents of Concern

The Facility was identified during the Remedial Investigation (RI), performed by Camp Dresser McKee (CDM) for IEPA, and the Pre-Design Investigation (PDI), undertaken by HS, as containing groundwater impacted with Volatile Organic Compounds (VOCs) above the Preliminary Remediation Goals (PRGs) identified in the ROD. The VOCs detected at concentrations above the PRGs are referred to as constituents of concern (COC). A network of 28 monitoring wells was established at the Facility during the PDI. The monitoring well locations, including proposed wells, are shown on Figure 2.

The PRGs were based on 35 IAC Part 620 Groundwater Quality Class I groundwater, 35 IAC Part 742 Tiered Approach to Corrective Action Objectives (TACO), and USEPA maximum contaminant level (MCL) regulations. The groundwater COC were identified as 1,1-dichloroethene (1,1-DCE); 1,2-dichloroethane (1,2-DCA); 1,2-dichloroethene (1,2-DCE); ethylbenzene; tetrachloroethene (PCE); 1,1,1-trichloroethane (1,1,1 TCA); 1,1,2-trichloroethane (1,1,2 TCA); trichloroethene (TCE); and vinyl chloride (VC), as agreed upon with USEPA and IEPA.

1.3 Hydrogeological Setting

The geological profile encountered at the facility generally consists of surface

pavement (asphalt, concrete pad, or concrete floor slab) with a gravel fill subbase from ground surface to one to two feet below ground surface (bgs), underlain by silty clay to a depth of four to eight feet bgs, which is underlain by poorly to well graded sand (predominantly fine to medium sand) with some gravelly units to below the maximum depth of the borings at the facility (140 feet).

The sand and gravel has been reported to extend to a depth of 230 to 250 feet bgs in the vicinity of Area 9/10. This glacial outwash is identified as the Mackinaw Member of the Henry Formation. Bedrock encountered in borings/wells in the area is part of the Ordovician period Ancell Group (sandstone) of the Paleozoic era (CDM, *Remedial Investigation Report, Southeast Rockford Groundwater Contamination Study*, 1995).

The vadose zone extends within the sand to a depth of approximately 30 to 35 feet bgs. Within the vadose zone sand there is a discontinuous one to four feet thick silt layer at approximately 18 to 23 feet bgs which was identified in the OSA. This layer was observed only in a limited area in the northwest portion of the Site. No other substantive or continuous fine grained layers or lenses were documented during the PDI investigation activities. At depth within the aquifer some coarser grained gravelly sand and sandy gravel units were observed.

The uppermost aquifer at the Site is the sand and gravel aquifer. The potentiometric surface level ranged between 30 and 33 feet bgs over the period May 2005 to February 2007. This level varies somewhat seasonally and appears to mirror the general rainfall pattern of the area. The average water level depth was approximately 32 feet bgs. The aquifer is greater than 100 feet in thickness at the Site. Recent data indicates the groundwater flow is to the west-southwest at a gradient of approximately 0.0008 feet per foot (ft/ft) (0.6 ft / 715 ft in March 2006) toward the Rock River.

The hydraulic conductivity of the sand aquifer has been estimated to be approximately 1.22×10^{-3} centimeters per second (cm/sec) (CDM, *Focused Feasibility Study* [FFS], 2000). The aquifer porosity was assumed to be 0.25 and the gradient 0.0066 ft/ft in the FFS. Using this hydraulic conductivity value and average porosity with the more recent hydraulic gradient data, it is estimated that the average linear velocity (also referred to as groundwater seepage velocity) is approximately 4 feet per year, but may have varied historically.

2.0 GROUNDWATER MONITORING

This GMP has been designed to address two separate groundwater monitoring programs at the site: 1) The Groundwater Management Zone and 2) Remediation Assessment.

2.1 Groundwater Management Zone

The GMZ established a three dimensional region containing groundwater being managed to mitigate impairment caused by a release of contaminants from the Facility in general accordance with 35 Illinois Administrative Code (IAC) Part 620.250. For a GMZ to be established, the groundwater within the proposed GMZ must be managed in an approved manner to mitigate impairment caused by the release of contaminants from a site. The Area 9/10 remedy consists of air sparging and soil vapor extraction to address impacted groundwater (leachate) at the Facility along with excavation and offsite disposal of source area soil from the Facility and has been approved by the Agencies. The GMZ was approved by the IEPA in a letter dated May 16, 2008.

Area 9/10 is part of the larger Southeast Rockford Groundwater Contamination Superfund Site. This area extends over a large portion of southeast Rockford and has several areas which have been identified for source control activities. Based on the analytical data collected to date, it appears there are upgradient facilities and operations that have impacted groundwater. This includes, but is not limited to, Source Area 11 of the Southeast Rockford Groundwater Contamination Superfund Site. It is important to note that groundwater sampling data indicates that impacted groundwater is and has been migrating onto the HS Plant #1 facility from the Southeast Rockford Groundwater Contamination Superfund Site and perhaps other known and unknown sources.

In any GMZ, the goal is remediation of the groundwater to the level of the standards applicable to that class of groundwater with consideration of background conditions that may eventually enter Area 9/10. This goal does not imply all groundwater within the GMZ must be returned to the groundwater standard. On the other hand, groundwater within the GMZ that is beyond the point of compliance as established under 35 Ill. Adm. Code Part 620.505(a) is to be remediated to the level applicable to that groundwater class. However, groundwater contamination within the three-dimensional zone between the compliance point wells and the waste management unit could still exceed the applicable standards at completion of the corrective action. If this is the case, post-remediation monitoring may be necessary.

2.2 GMZ Well Network

The GMZ monitoring network consists of 13 wells (GMZ-1 through GMZ-4, SMW-1, SMW-2, SMW-4, SMW-8, SMW-19, SMW-20, SMW-21, MW203, and MW7-FGA). Monitoring wells SMW-1, SMW-2, SMW-19, MW203, and MW7-FGA are on the hydraulically upgradient portion of the GMZ and monitoring wells GMZ-1 through GMZ-4, SMW-4, SMW-8, SMW-20 and SMW-21 are located near the

downgradient extent. The point of compliance wells are the eight (8) downgradient wells identified.

Performance monitoring of the hydrogen release compound (HRC-X[®]) placement will be completed in conjunction with quarterly sampling events at the OSA wells until abandonment and thereafter at GMZ-1. HRC-X[®] is a controlled release, electron donor material, to facilitate the reductive dechlorination process. Baseline groundwater parameters and samples will also be collected from the OSA wells prior to HRC-X placement.

2.3 Remediation Assessment Well Network

As discussed in the RAWP as part of the groundwater source area investigation, monitoring wells will be installed in a series of transects perpendicular to the general groundwater flow direction. Up to 12 monitoring wells may be installed in the southwest portion of the site in order to obtain data documenting current conditions and to observe changes in conditions over time as remedial efforts progress. The results of the systematic grid boring groundwater sampling will be used to assess the appropriate number and locations of the monitoring wells that will be proposed to USEPA and IEPA. Additional monitoring wells may be proposed and installed in other strategic locations as determined by groundwater monitoring results and upon review and evaluation of remediation activities.

2.4 Upgradient and Background Wells

Two additional immediate upgradient wells are planned as part of the RA Phase I Investigation activities. These wells will be sampled for VOCs only after installation. Additional upgradient wells may also be proposed and added in the future. The monitoring frequency and parameters of interest of the two planned wells, and other wells that may be added, will be proposed after the evaluation of the initial laboratory analytical results and reevaluated periodically.

2.5 Source Material Soil and Groundwater Remediation

The Area 9/10 Remedial Action will consist primarily of: 1) leachate remediation in the western portion of the South Alley via air sparge (AS) and soil vapor extraction (SVE) and 2) soil excavation and associated activities in the OSA and the loading dock area.

The AS and SVE system will consist of 15 and six wells, respectively. The AS and SVE wells will be operated in three banks of five AS wells and two SVE wells as an individual treatment cell. The treatment cells will be operated sequentially using a timing relay and air solenoid valves. Each of the banks will be pulsed for a period of four hours initially. The pulse time may be adjusted based on evaluation of the initial removal results.

The soil impacted by VOCs at the OSA is a 65 foot by 50 foot area of approximately 3,300 square feet. HS plans to address these soils by excavation with offsite soil disposal. The impacted soil is primarily in the soil column from ground surface to six feet in depth. The total estimated in place quantity of impacted soil at the OSA is 550

cubic yards (850 tons). Prior to the soil excavation, a Regensis® product, hydrogen release compound (HRC-X) will be introduced into the groundwater underlying the OSA through the existing wells. Placement of the HRC-X is described in Appendix G of the RAWP. The wells at the OSA are illustrated in Figure 3.

As previously discussed, these wells will be abandoned prior to the excavation activities in this area. A work plan for the excavation of the source material at the OSA was submitted to USEPA dated April 27, 2005 and was approved with modification on August 15, 2005 and was incorporated into the approved Final Remedial Design.

Soil excavation may also occur at the loading dock area, pending the RAWP investigation results. Remediation progress of the excavation activities in the loading dock area will be monitored by the remediation assessment well network.

Groundwater monitoring of the remedial progress at the OSA will be performed initially at the air sparge pilot test wells (ASDM-1 through ASDM-4). As noted previously, wells will be removed as part of the excavation activities. After excavation, well GMZ-1 will be installed downgradient of the OSA. Progress of the effect of the OSA remedial efforts in groundwater will be monitored by the GMZ well network. The results of the monitoring will be included in the semi-annual groundwater monitoring reports.

3.0 GROUNDWATER SAMPLING METHODS AND PROCEDURES

Eight consecutive quarters of groundwater sampling will be conducted at the GMZ monitoring network. The frequency of additional groundwater sampling events will be based on the analysis of contaminant distribution, seasonality, and variability of the eight quarterly events and previous groundwater data. It is anticipated that any additional groundwater monitoring will be conducted on either a quarterly or semi-annual basis unless a longer duration is mutually agreed upon with the Agencies. The following sections describe the groundwater sampling procedures.

3.1 Fluid Level Measurements

Prior to sampling the monitoring wells, fluid level measurements will be taken at each individual well. A water level indicator capable of measuring to the nearest 0.01 foot will be used. The depth to water (DTW) will be recorded and the total depth (TD) will be measured at least annually for each well. Between wells, the water level indicator tape will be decontaminated using a non-phosphate detergent and water spray followed by a distilled water rinse. The data will be noted in the project field book and on water elevation data sheets. The order in which monitoring wells will be measured and sampled will be from least to most impacted, as practical for each day of field activity.

3.2 Monitoring Well Purging

Groundwater samples will be collected from the monitoring wells via low flow sampling. As part of the low flow process, prior to sampling, groundwater quality parameters are to be measured. Field readings of pH, temperature, dissolved oxygen (DO), ferrous iron (Hach Field Test Kit or equivalent), oxygen reduction potential (ORP), and conductivity will be performed prior to purging and on groundwater collected from each purge volume, and noted on the field sampling sheet. Wells are considered adequately purged for sampling when the readings stabilized to ± 10 percent over three consecutive readings. The equipment will be decontaminated between the sampling of each monitoring well.

The pH/temperature/conductivity/DO/ORP meter shall be calibrated at the beginning of each day and after a minimum of each five hours used. Purge water collected during the sampling event will be temporarily placed in a portable tank or designated 55-gallon drum in a secure location prior to offsite treatment or disposal.

3.3 Groundwater Sample Collection

For the first eight quarters, the groundwater samples will be collected via low flow sampling. The low flow sampling will be conducted with a Grunfos® pump or equivalent. Estimated flow rates during the sampling event are expected to be between 300 milliliters per minute (ml/min) to 500 ml/min. During the low flow purging process, groundwater parameters (pH, conductivity, temperature and ORP) will be measured using a flow cell and water quality meter. Water quality reading will be collected at a minimum of 1 minute intervals. If three consecutive readings are within

10% of each other, groundwater parameters will be considered stable and groundwater samples will be collected. VOC samples will be collected by slowly filling the 40-ml glass vials from the low flow sampling equipment. Vials will be filled until a convex meniscus is present and then capped. The cap will then be secured on the vial. The vial will then be inspected for trapped air. Any samples with entrained air will be discarded, and a new sample collected.

Groundwater samples will be maintained at or below 4 degrees Celsius following collection prior to submittal to the laboratory under chain of custody procedures.

After the initial eight quarters, the groundwater sampling frequency and methodology will be re-evaluated to ensure that the objectives of the project are being met in an efficient manner. Changes in the sampling program determined to be appropriate will be proposed to the USEPA and IEPA for approval prior to implementation.

3.4 Analytical Methods and Quality Assurance / Quality Control

The GMZ and remediation assessment groundwater monitoring well network samples will be submitted for laboratory analysis for VOCs and for monitoring natural attenuation parameters. The analytical methods and associated quality assurance (QA) and quality control (QC) samples will be identified in the Field Sampling Plan (FSP) and the Quality Assurance Plan (QAP). The analytical methods used and the QA/QC of the samples will be in accordance with these documents unless otherwise noted.

3.5 Quality Control Samples

Quality control (QC) samples are to be collected as part of the groundwater monitoring. Field QC samples will be submitted as separate samples to the laboratory and reported accordingly. Field blanks, matrix spike, matrix spike duplicates, field duplicates, and trip blanks shall be part of this monitoring. Additional information regarding the preparation of these samples is provided below. The frequency of the QC samples will be specified in the QAP.

- Field blanks will consist of deionized water that is taken to the field, transferred to the appropriate container and preserved. The use and frequency of field blanks will be specified in the QAP.
- A matrix spike is defined as an aliquot of sample spiked with a known concentration of the analyte of interest. Percent recovery of the known concentration of added analyte is used to assess the accuracy of the analytical process. The spiking occurs prior to the sample preparation and analysis. The matrix spike is used to document the accuracy of a method due to sample matrix changes and not to control the analytical process. The analysis of matrix spikes is a measure of accuracy and is calculated by percent recovery.
- Matrix spike duplicates will be prepared in the same manner as the matrix spike samples and used to assess the precision of the matrix spike analysis.

- Field duplicates consist of groundwater samples collected in the field using the same methodology as the original sample. Field duplicate samples will be transferred to an appropriate laboratory supplied sample container and treated as an independent sample with the exception that the field duplicate samples will be labeled in such a manner as to not indicate the time or location in which the sample was collected (i.e. blind duplicates).
- Trip blanks will also be placed in each cooler of groundwater samples shipped to the laboratory.

4.0 MONITORED NATURAL ATTENUATION

Monitored natural attenuation (MNA) is defined as the reliance on natural processes to achieve specific remediation objectives. Natural processes include biodegradation, chemical reactions, adsorption, volatilization, and dilution. The MNA parameters, detailed below, will be measured and reported in the groundwater monitoring activities.

Prior to the implementation of MNA, constituent specific mass estimates will be made for both soil and groundwater media for Area 9/10 based on the analytical results. Baseline constituent mass estimations may be modified and updated based upon additional source area investigation results, fluctuating onsite groundwater concentrations, and offsite sources potentially migrating onto Area 9/10 via groundwater. The baseline mass estimation will be used to indicate overall remediation progress of Area 9/10. The planned soil remediation activities (SVE and excavation and disposal) are intended to reduce mass loading to groundwater and within the plume and therefore drive the mass balance closer to the attenuation capacity of the aquifer. An analysis of residual contaminants with respect to mass loading, attenuation capacity, and plume stability will be performed.

As part of the groundwater monitoring program, in situ parameters will be collected to determine and monitor the natural attenuation capacity within the aquifer. The field parameters to be collected are pH, temperature, DO, conductivity, ORP, and ferrous iron. This data will be collected as described in Section 3.2.

In addition to in situ parameters, groundwater samples will be collected for laboratory analysis. Parameters for laboratory analysis include nitrate, sulfate, alkalinity, total organic carbon (TOC), methane, ethane, ethene, and hydrogen. Ethane, ethene, and methane will be collected in accordance with the Microseep sampling protocol. The current Microseep sampling protocol included in Appendix A. The natural attenuation parameters and analytical methods are summarized on Table 1.

Groundwater monitoring will continue after termination of active remediation. Once the parameters from the monitoring activities indicate that contaminant concentrations in the groundwater plume at the Facility are stable or decreasing, a MNA monitoring program may be discussed with the Agencies.

5.0 REPORTING

A Groundwater Monitoring Report will be prepared and submitted to USEPA and IEPA on a semi-annual basis for the initial two years of groundwater monitoring. After this initial period, HS may propose an alternative reporting schedule which is appropriate for the remedial conditions at the time and will be implemented upon approval by the Agencies. The reports will be submitted by the end of January and July for the previous monitoring period. The January report will provide a summary of the entire year of groundwater data. The report will include a section discussing the groundwater monitoring activities.

The January Groundwater Monitoring Report will include data from the previous calendar year as follows:

- Static water level potentiometric surface maps for the HS site;
- Site maps showing the analytical results which exceed PRGs for each groundwater sampling event at the GMZ monitoring wells;
- Summary tables of groundwater elevations and groundwater sample analytical data;
- Copies of the groundwater analytical reports; and
- An evaluation of the attenuation capacity of the aquifer and the estimated mass flux from the source areas.

The July Groundwater Monitoring Report will be a data report which will include the following data collected in the first and second quarters of the current year:

- Summary tables of groundwater elevations and groundwater sample analytical data; and
- Copies of the groundwater analytical reports



FIGURES

**AREA 9/10 REMEDIAL ACTION
GROUNDWATER MONITORING PLAN**

**SOUTHEAST ROCKFORD GROUNDWATER
CONTAMINATION SUPERFUND SITE
ROCKFORD, ILLINOIS**

CERCLIS ID NO. ILD981000417

SEPTEMBER 2008

PREPARED BY



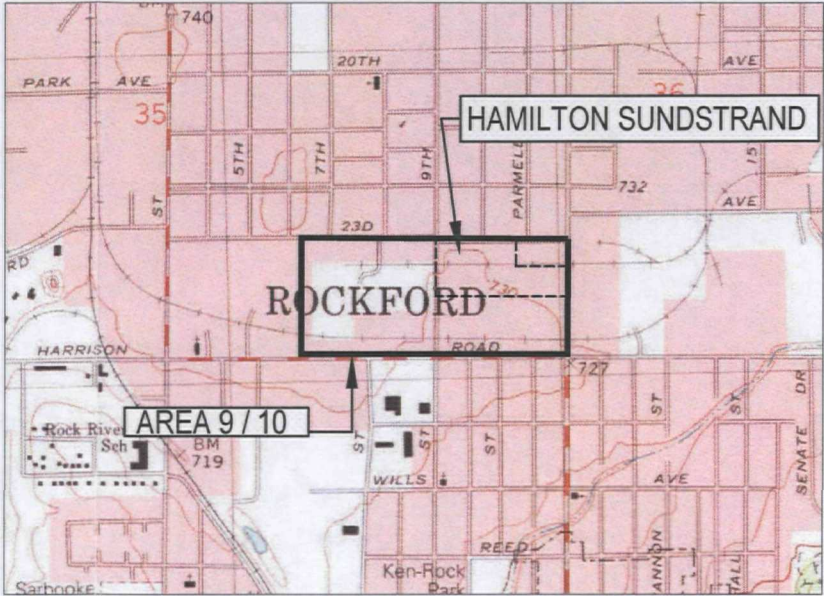
Stantec

446 EISENHOWER LANE NORTH
LOMBARD, ILLINOIS
PHONE: (630) 792-1680/792-1691 (FAX)

SECOR PN: 13UN.02072.08.0103

GROUNDWATER MONITORING PLAN

LOCATION MAP



REFERENCE: USGS 7.5 MINUTE QUADRANGLE; ROCKFORD SOUTH, ILLINOIS; 1993

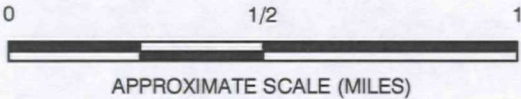
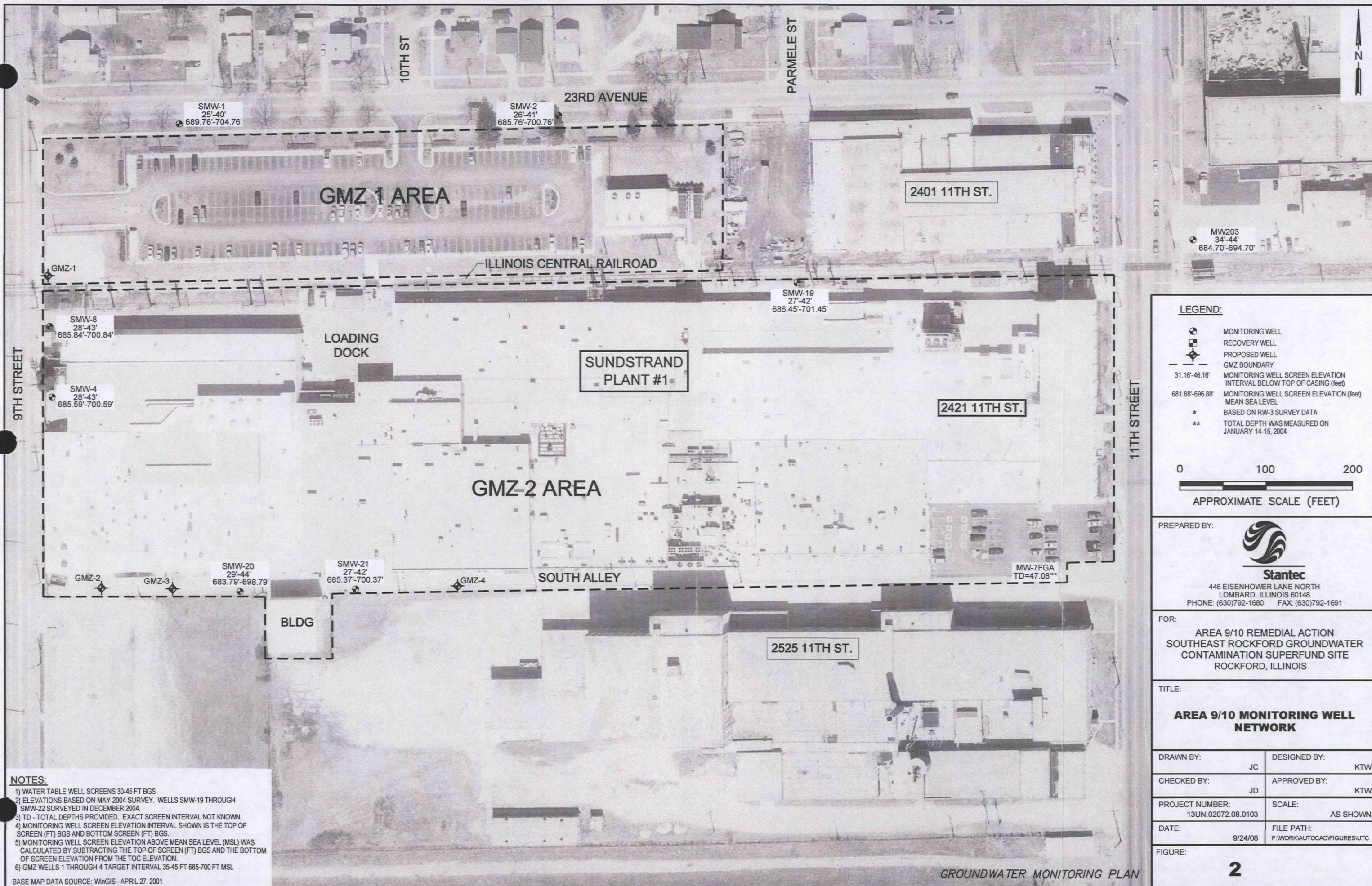


FIGURE INDEX

FIGURE NUMBER	TITLE AND DESCRIPTION
1	AREA 9/10 SITE LOCATION
2	AREA 9/10 MONITORING WELL NETWORK
3	OSA WELLS

A		ISSUED FOR REVIEW				DESIGNED BY: JD
B		ISSUED FOR REVIEW				CHECKED BY: JD
0						APPROVED BY: KTW
1						DRAWN BY: JC
REV	DATE	DESCRIPTION	DSGN	CHCK	APPRV	DATE: 9/24/08

FIGURE: **1**



NOTES:

- 1) WATER TABLE WELL SCREENS 30-45 FT BGS
- 2) ELEVATIONS BASED ON MAY 2004 SURVEY. WELLS SMW-19 THROUGH SMW-22 SURVEYED IN DECEMBER 2004.
- 3) TD - TOTAL DEPTHS PROVIDED. EXACT SCREEN INTERVAL NOT KNOWN.
- 4) MONITORING WELL SCREEN ELEVATION INTERVAL SHOWN IS THE TOP OF SCREEN (FT) BGS AND BOTTOM SCREEN (FT) BGS.
- 5) MONITORING WELL SCREEN ELEVATION ABOVE MEAN SEA LEVEL (MSL) WAS CALCULATED BY SUBTRACTING THE TOP OF SCREEN (FT) BGS AND THE BOTTOM OF SCREEN ELEVATION FROM THE TOC ELEVATION.
- 6) GMZ WELLS 1 THROUGH 4 TARGET INTERVAL 35-45 FT 685-700 FT MSL

BASE MAP DATA SOURCE: WinGIS - APRIL 27, 2001

LEGEND:

- MONITORING WELL
- RECOVERY WELL
- PROPOSED WELL
- GMZ BOUNDARY
- 31.16'-46.16' MONITORING WELL SCREEN ELEVATION INTERVAL BELOW TOP OF CASING (feet)
- 681.88'-696.88' MONITORING WELL SCREEN ELEVATION (feet) MEAN SEA LEVEL
- * BASED ON RW-3 SURVEY DATA
- ** TOTAL DEPTH WAS MEASURED ON JANUARY 14-15, 2004

0 100 200
APPROXIMATE SCALE (FEET)

PREPARED BY:



Stantec

446 EISENHOWER LANE NORTH
LOMBARD, ILLINOIS 60148
PHONE: (630)792-1680 FAX: (630)792-1691

FOR:

AREA 9/10 REMEDIAL ACTION
SOUTHEAST ROCKFORD GROUNDWATER
CONTAMINATION SUPERFUND SITE
ROCKFORD, ILLINOIS

TITLE:

**AREA 9/10 MONITORING WELL
NETWORK**

DRAWN BY:

DESIGNED BY:

JC

KTW

CHECKED BY:

JD

APPROVED BY:
KTW

PROJECT NUMBER:

13UN.02072.08.0103

SCALE:

AS SHOWN

DATE:

9/24/08

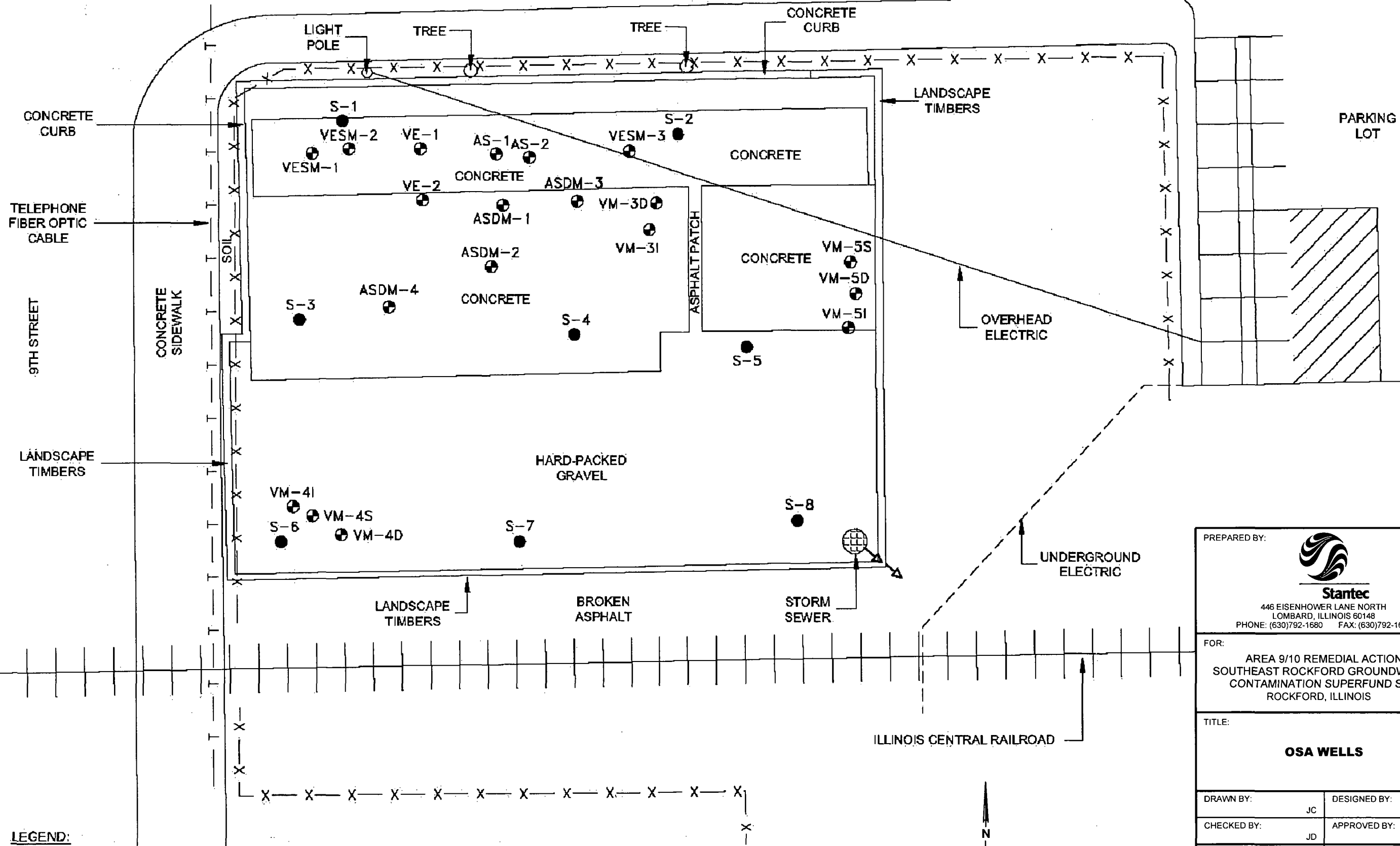
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FIGURE:

2

GROUNDWATER MONITORING PLAN



PREPARED BY:  Stantec 446 EISENHOWER LANE NORTH LOMBARD, ILLINOIS 60148 PHONE: (630)792-1680 FAX: (630)792-1691	
FOR: AREA 9/10 REMEDIAL ACTION SOUTHEAST ROCKFORD GROUNDWATER CONTAMINATION SUPERFUND SITE ROCKFORD, ILLINOIS	
TITLE: OSA WELLS	
DRAWN BY:	DESIGNED BY:
JC	KTW
CHECKED BY:	APPROVED BY:
JD	KTW
PROJECT NUMBER:	SCALE:
13UN.02072.08.0103	AS SHOWN
DATE:	FILE PATH:
9/24/08	F:\WORK\AUTOCAD\FIGURES
FIGURE: 3	

TABLES

Table 1
Natural Attenuation Parameters and Analytical Methods
Area 9/10 - Southeast Rockford Groundwater Contamination Superfund Site

Rockford, Illinois

Parameter	Method of Evaluation (USEPA or Other)	Concentration in Source Zone or Change from Background	Explanation of Likely Reductive Dechlorination Activity
Alkalinity	310.1		
Dissolved Oxygen (D.O.)	Field Measurement	< 0.5 mg/l	Oxygen suppresses reductive dechlorination. CisDCE, 1,1-DCE, 1,1-DCA, VC, methylene chloride, and chloromethane may degrade aerobically.
Ethane	AM20GAX	Present	Daughter product of reductive dechlorination of 1,1,1-TCA. Also produced from ethene.
Ethene	AM20GAX	Present	Daughter product of reductive dechlorination of VC.
Ferrous Iron (Fe ²⁺)	3500 Field Measurement	Increase over background - Concentration above 1 mg/L	Reductive dechlorination may take place under iron reducing conditions. VC may not be oxidized under these conditions.
Hydrogen (H ₂)	AM20GAX	> 1 nM	Reductive dechlorination possible. VC may accumulate.
Hydrogen (H ₂)	AM20GAX	< 1 nM	VC oxidized. Reductive dechlorination may be limited by weakly reducing conditions.
Methane	AM20GAX	Increase over background	Indicates the most reduced groundwater conditions. VC may accumulate at methane >0.5 mg/l.
Nitrate (NO3)	9056	< 1 mg/l	Presence of NO ⁻ suppresses reductive dechlorination. Methylene chloride, VC, other low chlorinated compounds may degrade in the presence of NO ⁻³ .
Oxidation Reduction Potential (ORP)	Field Measurement with Ag/AgCl electrode	<-100 mV <50 mV	Reductive dechlorination likely. Reductive dechlorination possible.
pH	Field Measurement	5 < pH < 9	Optimal range for microbial activity.
Sulfate (SO ₄ ²⁻)	9056	Decrease compared to background	Reductive dechlorination may occur under SO ₄ ⁻² reducing conditions. However, high levels of SO ₄ ²⁻ can inhibit reductive dechlorination.
Total Organic Carbon (TOC)	5310	> 20 mg/l	Source of organic carbon necessary as driver for reductive dechlorination to proceed. Anthropogenic sources of carbon include BETX

Note: Comprehensive analysis of all parameters will be completed quarterly in year 1. Thereafter selective analysis will be identified based on the year 1 dataset.
Based on the Wisconsin DNR Publication RR-699, "Understanding Chlorinated Hydrocarbon Behavior in Groundwater: Investigation, Assessment and Limitations of Monitored Natural Attenuation". Adapted from Wiedemeir, 1998.

APPENDIX A

Microseep Sampling Procedure

Microseeps Gas Stripping Cell Instructions

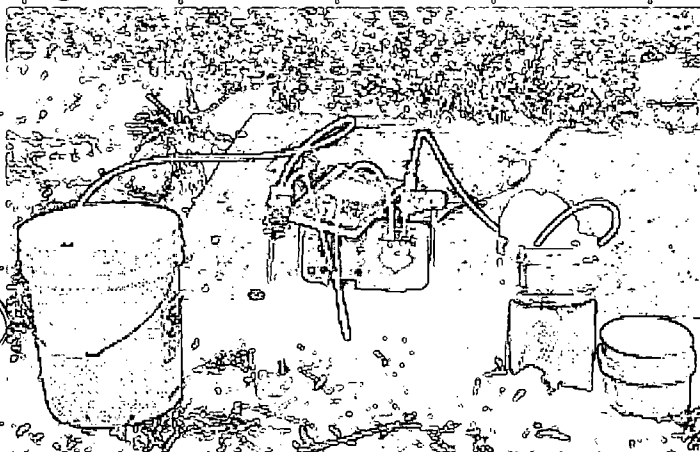
[Back to Microseeps Homepage](#)

[Choosing Sampling Pumps for Hydrogen from Deep Wells](#)

INSTALLATION AND OPERATION

To place the gas stripping cell into service:

Image 1.



[Back to step 11](#)

1. Remove one of the cell assemblies from the packing carton. See [Figure 1](#).

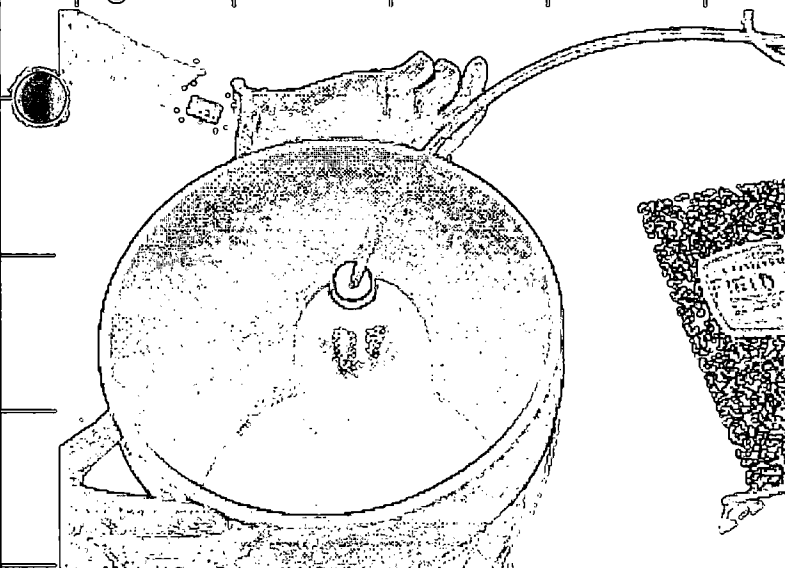
2. Image 1. Connect the inlet tube of the cell to the outlet of your pump. The inlet tube is designed to connect to 1/4 O.D. hard tubing. Secure the connection using binder clips or cable ties.

3. Insert the drain tube of the cell into a waste container, keeping the end of the tube at the bottom of the container. Any waste container of suitable size may be used. A 2-Liter soda pop bottle may be placed in the waste container to determine pumping flow rate.

4. Secure the cell assembly so that the housing cover (stopper) is above the glass housing (i.e. upright). A ring stand and clamp are recommended for this purpose.

5. Turn the pump on and check for leaks. If any leaks are found, seal them before proceeding.

Image 2.



6. Image 2. Measure, in mL per minute, the flow rate of the pump. If a 2-Liter soda pop bottle is used, the flow rate can be determined by measuring how many minutes it takes to fill the bottle and substituting the measured time into the following equation:

$$\text{Flow} = 2000 \text{ mL} / \text{Time to fill (in minutes)}$$

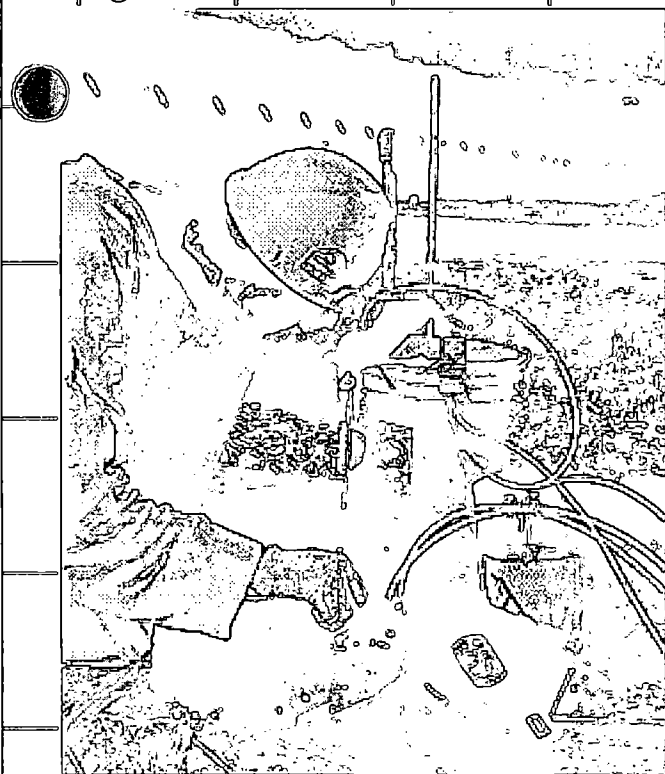
Consult Table 1 to determine the equilibrium time needed to bubble strip at this flow rate.

Note: Use a flow rate between 100 mL/min. and 500 mL/min. Do not turn off the pump.

Table 1.

Flow rate (mL/min)	Sampling time (min)
100-120	30
130-150	25
160-200	20
210-300	15
>300	10
<u>Return to Step 6</u>	
<u>Return to Step 10</u>	

Image 3.



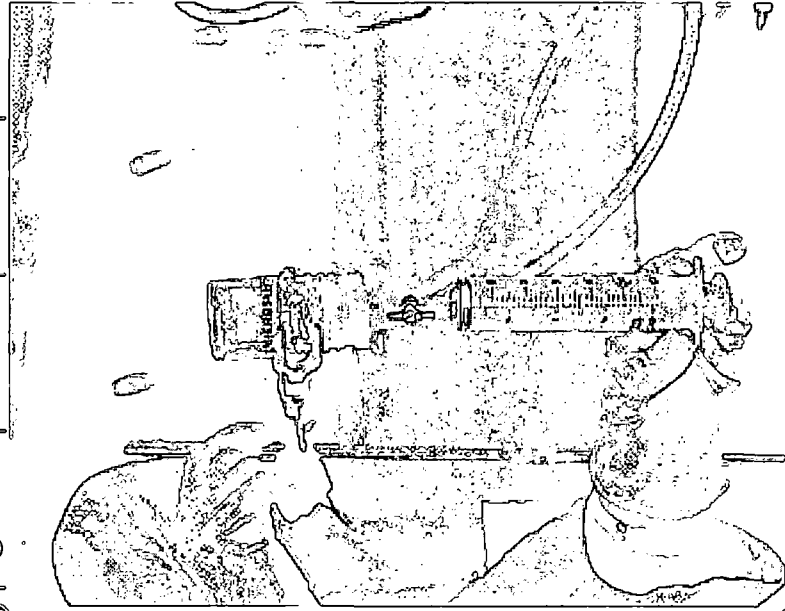
7. Image 3. Unclamp the cell assembly, invert it, and re-secure the assembly in the inverted position. Make sure the drain tube is still in the waste container and the end of the drain tube is near the bottom of the bottle.

Image 4.



8. Image 4. Connect the stopcock to the syringe and the needle to the stopcock (zoom in on image). Place the stopcock in the open position (so that the stopcock handle is in-line with the syringe). Draw the plunger back on the syringe to the 20.0 mL mark pulling ambient air into the syringe.

Image 5.



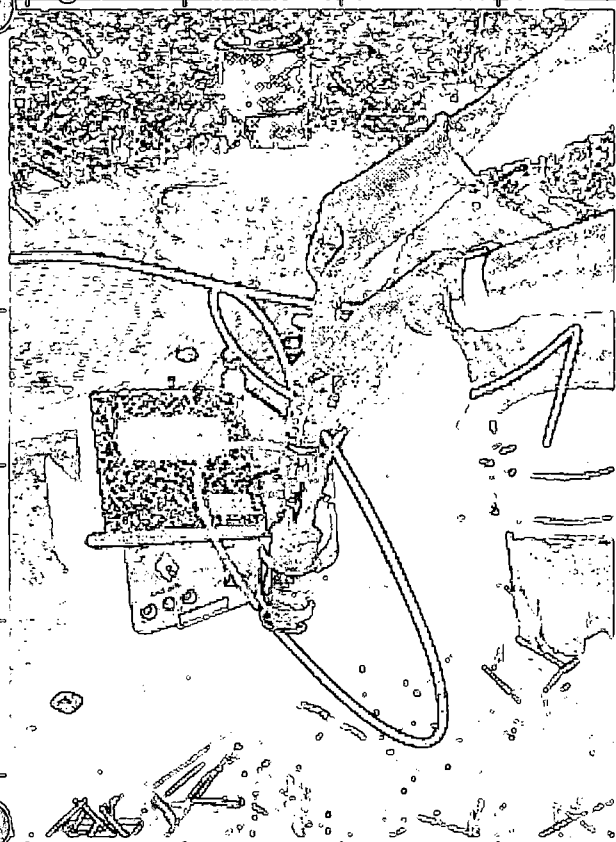
9. Image 5. Keeping the cell in the inverted position, insert the needle into the needle guide. Pierce the septum and inject the air into the cell creating the bubble. Withdraw the needle from the assembly and carefully place the needle into the cover. Do not discard the syringe apparatus.

10. Start timing and let the groundwater pump through the cell for time specified in Table 1 for your particular pumping speed. Meanwhile, be sure that the sample vial is properly labeled and that the flow rate and any other relevant field data are recorded in the field log.

Note: Be sure to keep the end of the drain tube at the bottom of the waste container. This will insure that outside air is not drawn into the cell. Failure to do this will invalidate the sample.

11. When equilibration time is up, turn off the pump, unclamp the cell, and re-clamp it in its upright position. See Image 1. Verify that the plunger of the syringe is pushed all the way in and that the stopcock is in the open position.

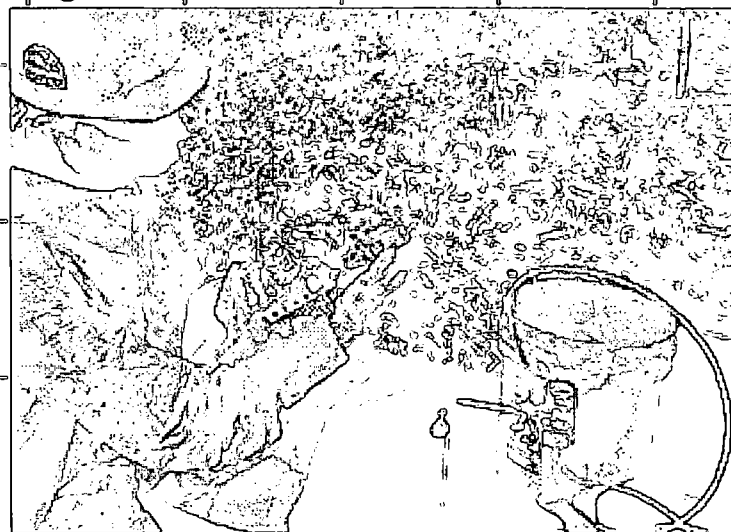
Image 6.



12. Image 6. Insert the needle into the needle guide and pierce the septum. Withdraw 1 mL of gas by pulling back on the syringe plunger while holding the syringe body in place. Remove the syringe from the cell and expel the sample.

13. Immediately re-insert the needle into the needle guide and pierce the septum. Withdraw a 15 mL sample of gas (being careful not to pull any water into the syringe). With the needle still through the septum, close the stopcock and withdraw the needle from the septum.

Image 7.



14. Image 7. Immediately insert the needle through the septum on the sample vial. Keeping the syringe and vial "in line", open the stopcock and completely depress the syringe plunger injecting the entire sample into the vial.

Image 8.



15. Image 8. Keeping the plunger depressed, quickly remove the vial from the needle. Your sample is now ready to be packaged and shipped back to Microseeps for analysis. Do not cool the samples.

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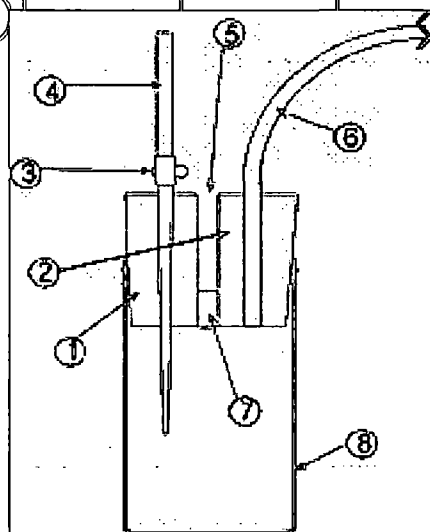
Decontamination/Cleaning

Pump at least 1 liter of potable water through the cell. The cell assembly is now ready for re-use.

The only expendable part of the cell is the sampling septum (part 7). Normally, each septum may be used for the collection of up to 5 samples. If bubbles are seen rising up from the septum when the cell is inverted the septum **MUST** be replaced. Instructions for replacing the septum are provided below.

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Figure 1. Cross section of Microseeps Gas Stripping Cell



1. Housing Cover

2. Jet Spray Nozzle

3. Nylon Tie

4. Inlet Tube

5. Needle Guide Port

6. Drain Tube

7. Replaceable Septum

8. Glass Housing

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Replacing the Sampling Port Septum

All part numbers refer to Figure 1.

1. Remove the housing cover (part 1) from the glass housing (part 8).

2. Use a handy, blunt tipped object to push the replaceable septum (part 7) out of the housing cover. The cover to a needle works well for this purpose, but be sure that the needle is NOT in the cover. Discard the old septum.

4. Take a new septum and wet both the new septum and the housing cover with potable water.

5. Carefully using the same blunt instrument used in step three above, slide the new septum into the hole from which the old septum was removed. The bottom of the new septum must be flush with the narrow end of the housing cover.

6. If the housing cover is not still wet, wet it again with potable water. Place the bottom end of the housing cover into the glass housing and push it in until less than 3/8" are above the rim of the glass housing. This may require some force.

7. Follow the cleaning procedures described above to prepare the cell for a return to service.

[back to top](#)

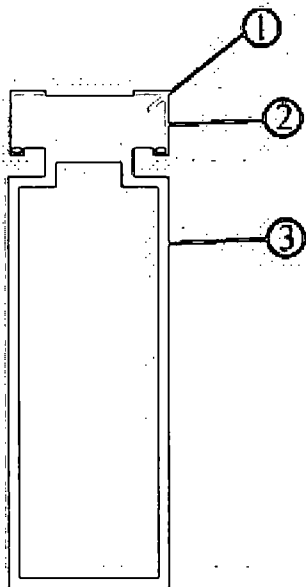


Figure 2. Cross
section of septum
bottle

1. Septum

2. Metal Closure

3. Glass vial

SAMPLING QUESTIONS?

CALL MICROSEEPS AT 1-412-826-5245

MON.- FRI. 7:30 AM TO 6 PM EST

[Back to Microseeps Homepage](#)

APPENDIX J

IEPA Model Environmental Land Use Control Form

PREPARED BY:

Name: _____

Address: _____

RETURN TO:

Name: _____

Address: _____

THE ABOVE SPACE FOR RECORDER'S OFFICE

Model Environmental Land Use Control

THIS ENVIRONMENTAL LAND USE CONTROL ("ELUC"), is made this _____ day of _____, 20____, by _____, ("Property Owner") of the real property located at the common address _____ ("Property").

WHEREAS, 415 ILCS 5/58.17 and 35 Ill. Adm. Code 742 provide for the use of an ELUC as an institutional control in order to impose land use limitations or requirements related to environmental contamination so that persons conducting remediation can obtain a No Further Remediation determination from the Illinois Environmental Protection Agency ("IEPA"). The reason for an ELUC is to ensure protection of human health and the environment. The limitations and requirements contained herein are necessary in order to protect against exposure to contaminated soil or groundwater, or both, that may be present on the Property as a result of [VARIABLE] activities. Under 35 Ill. Adm. Code 742, the use of risk-based, site-specific remediation objectives may require the use of an ELUC on real property, and the ELUC may apply to certain physical features (e.g., engineered barriers, monitoring wells, caps, etc.).

WHEREAS, _____ [the party performing remediation] intends to request risk-based, site specific soil and groundwater remediation objectives from IEPA under 35 Ill. Adm. Code 742 to obtain risk-based closure of the site, identified by Bureau of Land [10-digit LPC or Identification number] _____, utilizing an ELUC that will apply to the Property.

NOW, THEREFORE, the recitals set forth above are incorporated by reference as if fully set forth herein, and the Property Owner agrees as follows:

Section One. Property Owner does hereby establish an ELUC on the real estate, situated in the County of _____, State of Illinois and further described in Exhibit A attached hereto and incorporated herein by reference (the "Property").

Attached as Exhibit B are site maps that show the legal boundary of the Property, any physical features to which the ELUC applies, the horizontal and vertical extent of the contaminants of concern above the applicable remediation objectives for soil or groundwater or both, and the nature, location of the source, and direction of movement of the contaminants of concern, as required under 35 Ill. Adm. Code 742.

Section Two. Property Owner represents and warrants **he/she** is the current owner of the Property and has the authority to record this ELUC on the chain of title for the Property with the Office of the Recorder or Registrar of Titles in _____ County, Illinois.

Section Three. The Property Owner hereby agrees, for **himself/herself**, and **his/her** heirs, grantees, successors, assigns, transferees and any other owner, occupant, lessee, possessor or user of the Property or the holder of any portion thereof or interest therein, that **[INSERT RESTRICTION (e.g. the groundwater under the Property shall not be used as a potable supply of water, and any contaminated groundwater or soil that is removed, excavated, or disturbed from the Property described in Exhibit A herein must be handled in accordance with all applicable laws and regulations)]**.

Section Four. This ELUC is binding on the Property Owner, **his/her** heirs, grantees, successors, assigns, transferees and any other owner, occupant, lessee, possessor or user of the Property or the holder of any portion thereof or interest therein. This ELUC shall apply in perpetuity against the Property and shall not be released until the IEPA determines there is no longer a need for this ELUC as an institutional control; until the IEPA, upon written request, issues a new No Further Remediation determination approving modification or removal of the limitation(s) or requirement(s); and until a release or modification of the land use limitation or requirement is filed on the chain of title for the Property.

Section Five. Information regarding the remediation performed on the Property may be obtained from the IEPA through a request under the Freedom of Information Act (5 ILCS 140) and rules promulgated thereunder by providing the IEPA with the [10-digit LPC or identification number] listed above.

Section Six. The effective date of this ELUC shall be the date that it is officially recorded in the chain of title for the Property to which the ELUC applies.

WITNESS the following signatures:

Property Owner(s)

By: _____

Its: _____

Date: _____

STATE OF ILLINOIS)
) SS:
COUNTY OF)

I, _____ the undersigned, a Notary Public for said County and State, DO HEREBY CERTIFY, that _____ and _____, personally known to me to be the Property Owner(s) of _____, and personally known to me to be the same persons whose names are subscribed to the foregoing instrument, appeared before me this day in person and severally acknowledged that in said capacities they signed and delivered the said instrument as their free and voluntary act for the uses and purposes therein set forth.

Given under my hand and official seal, this _____ day of _____, 20__.

Notary Public

State of _____)
) S.S.
County of _____)

I, _____, a notary public, do hereby certify that before me this day in person appeared _____, personally known to me to be the Property Owner(s), of _____, each severally acknowledged that they signed and delivered the foregoing instrument as the Property Owner(s) herein set forth, and as their own free and voluntary act, for the uses and purposes herein set forth.

Given under my hand and seal this _____ day of _____, 20__.

Notary Public

PIN NO. XX-XX-XXX-XXX-XXXX
(Parcel Index Number)

Exhibit A

The subject property is located in the City of _____, _____ County, State of Illinois,
commonly known as _____, _____, Illinois and more
particularly described as:

**LIST THE COMMON ADDRESS;
LEGAL DESCRIPTION; AND
REAL ESTATE TAX INDEX OR PARCEL #
(PURSUANT TO 742.1010(D)(2))**

Exhibit B

IN ACCORDANCE WITH SECTION 742.1010(D)(8)(A)-(D), PROVIDE ALL THE FOLLOWING ELEMENTS. ATTACH SEPARATE SHEETS, LABELED AS EXHIBIT B, WHERE NECESSARY.

- (A) A scaled map showing the legal boundary of the property to which the ELUC applies.**
- (B) Scaled maps showing the horizontal and vertical extent of contaminants of concern above the applicable remediation objectives for soil and groundwater to which the ELUC applies.**
- (C) Scaled maps showing the physical features to which an ELUC applies (e.g., engineered barriers, monitoring wells, caps, etc.).**
- (D) Scaled maps showing the nature, location of the source, and direction of movement of the contaminants of concern.**



APPENDIX K

IEPA Greener Cleanups Matrix



Greener Cleanups

Greener cleanups refers to a method of site remediation that makes:

- the actual cleanup more efficient and less polluting, and
- results in a site where the development is designed to reduce the environmental impacts of future use.

Lots of decisions are made during an investigation and cleanup that have a range of environmental costs and benefits. For example, is it better to dig and haul or manage waste in place? Does it make sense to pump and treat for 30 years? Should we consider alternative treatment technologies? What are the impacts of our decisions, in terms of air and water pollution?

Illinois EPA is working with U.S. EPA Region 5 to identify ways to improve the environmental performance of remediation projects. This effort will include all of the programs under the Division of Remediation Management.





Illinois' Greener Cleanups Matrix: How to Maximize the Environmental Benefits of Site Remediation

Illinois EPA has created a matrix to guide site owners and consultants in choosing sustainable practices that can be applied to site assessment, planning and design, and cleanup.

The matrix lists individual actions, followed by a qualitative ranking of their level of difficulty and feasibility (sub-categorized by cost, schedule and technical complexity). The benefits of each action to air, water, land and energy are also identified.

To build the matrix, Illinois EPA evaluated certain cleanups from the Leaking UST, SRP, CERCLA and RCRA programs using site-specific questionnaires, field visits and consultations with green remediation practitioners.

More Information

- Greener Cleanups June 27, 2007 Meeting Summary
- Illinois EPA Greener Cleanups White Paper
- Illinois EPA June 27, 2007 speaker presentations
 - Green Remediation Presentation - Pachon 
 - Greener Brownfields Redevelopment - Parnell Place/Laberge 
 - Greener Cleanup - Integrating Sustainability into EPA's Cleanup Programs/Goldblum 
 - Greener Cleanups Meeting - Reynolds 
- Links

Email us with your questions or comments.

Greener Cleanups: How to Maximize the Environmental Benefits of Site Remediation

site assessment

design and design

benefits

air

water

land

energy

feasibility

action

level of

cost

schedule

technical complexity



site assessment	Collect data necessary for site-specific risk assessment.	➤	●	●	●	Improves decision-making and helps to prioritize action.			
	Collect data necessary to evaluate recycling options for waste and debris.	➤	●	●	●				
	Collect data necessary to evaluate alternate treatment methods.	➤	●	●	●●				
design and design	Develop and quantify "base case" remediation scenario.	➤	●	●	●	Base case data allow comparison of "standard" cleanup with "greener" cleanup.			
	Organize site layout to meet operational needs and reduce excavation requirements.	➤	●●●	●	●	Reduces air emissions from on-site construction equipment and from trucking waste materials.		Reduces waste material requiring off-site disposal.	Reduces fuel use in on-site construction equipment and in trucking waste materials.
	Use engineered barriers.	➤	●	●	●	Reduces air emissions from on-site construction equipment and from trucking waste materials.		Reduces waste material requiring off-site disposal.	Reduces fuel use in on-site construction equipment and in trucking waste materials.
	Use permeable barriers.	➤	●	●	●●		Increase long-term permeability of site to reduce stormwater runoff.		
	Use institutional controls.	➤	●●●	●●●	●	Reduces air emissions from on-site construction equipment and from trucking waste materials.		Reduces waste material requiring off-site disposal.	Reduces fuel use in on-site construction equipment and in trucking waste materials. Reduces energy use in remediation systems.
	Use site-specific risk assessments.	➤	●	●	●●	Reduces fuel use in on-site construction equipment and in trucking waste materials. Reduces energy use in remediation systems.		Reduces waste material requiring off-site disposal.	Reduces fuel use in on-site construction equipment and in trucking waste materials. Reduces energy use in remediation systems.
	Use soil management zones.	➤	●●	●	●	Reduces air emissions from trucking waste materials.		Reduces waste material requiring off-site disposal.	Reduces fuel use in trucking waste materials.
	Develop sequencing plan for work to integrate cleanup with construction.	➤	●●●	●●●	●●	Reduces air emissions from on-site construction equipment by combining project phases.	Reduces erosion.	Reduces waste material requiring off-site disposal and reduces interim fill requirements.	Reduces fuel use in on-site construction equipment by combining project phases.
	Identify salvage options for materials from existing structures.	➤	●	●	●			Reduces waste material requiring off-site disposal.	
	Identify recycling options for waste and debris, such as metal, C&D, slag, and tires	➤	●	●	●●			Reduces waste material requiring off-site disposal.	
	Consider reuse options for existing structures.	➤	●	●	●●●	Reduces air emissions from demolition activities.		Reduces waste material requiring off-site disposal.	Reduces fuel use in on-site construction equipment and in trucking waste materials.
	Consider structural reuse of slabs or foundations.	➤	●	●	●●●	Reduces air emissions from demolition activities.		Reduces waste material requiring off-site disposal.	Reduces fuel use in on-site construction equipment and in trucking waste materials.
	Evaluate active in-situ treatment systems, such as soil vapor extraction, enhanced bioremediation or air sparging.	➤	●	●	●●●	Reduces air emissions from on-site construction equipment and trucking waste material.	Reduces erosion and potable water use.	Reduces waste material requiring off-site disposal.	
	Evaluate passive in-situ treatment methods, such as in-place oxidation or phytoremediation.	➤	●	●	●●●	Reduces air emissions from on-site construction equipment and trucking waste material.	Reduces erosion and potable water use.	Reduces waste material requiring off-site disposal.	Reduces purchased energy use.
	Evaluate remediation technologies that permanently destroy contaminants.	➤	●●●	●●	●●●	Reduces air emissions from on-site construction equipment and trucking waste material. Reduces future migration concerns.	Reduces future migration concerns.	Reduces future migration concerns.	
	Perform a life-cycle analysis of cleanup plan.	➤	●	●	●●	Life-cycle analysis supports informed decision-making considering time, cost, remedy effectiveness, and environmental impact of the alternatives.			



High
Medium
Low

● indicates a benefit may add cost, time, or technical complexity - the number of symbols indicates the relative amount of the increase.
● indicates a benefit may reduce cost, time, or technical complexity - the number of symbols indicates the relative amount of the reduction.
● indicates a benefit may add or reduce cost, time, or technical complexity depending on the project specifics.
● indicates a benefit won't likely impact cost, time, or technical complexity.

Greener Cleanups: How to Maximize the Environmental Benefits of Site Remediation

cleanup

benefits

action	level of	feasibility			air	water	land	energy
		cost	schedule	technical complexity				
Impose idling restrictions on construction equipment.	High	●	●	●	Reduces air emissions from on-site construction equipment and from staged vehicles.			Reduces fuel use in on-site construction equipment and in trucking waste materials.
Use low-sulfur diesel fuel.	Medium	●	●	●	Reduces air emissions from on-site construction equipment and from staged vehicles.			
Use alternate fuels (biodiesel, E85).	Medium	●	●	●	Reduces air emissions from on-site construction equipment and from trucking waste materials.			Reduces use of petroleum products in on-site construction equipment and in trucking waste materials.
Use construction equipment with enhanced emission controls.	Medium	●	●	●	Reduces air emissions from on-site construction equipment and from staged vehicles.			
Sequence work to minimize double-handling of materials.	High	●●●	●●●	●	Reduces air emissions from on-site construction equipment. Reduces nuisance dust from stockpiles.	Reduces erosion.		Reduces fuel use in on-site construction equipment.
Cover stockpiles with tarps, apply alternate dust-control measures, or vegetate stockpiles.	High	●	●	●	Reduces nuisance dust from stockpiles.	Reduces erosion.		
Collect rain water for on-site use, such as dust control.	High	●	●	●		Reduces potable water use.		
Implement a water conservation plan.	High	●	●	●		Reduces potable water use.		
Capture and treat greywater for reuse.	Medium	●	●	●●		Reduces potable water use.		
Abandon rather than remove subsurface structures.	Medium	●●	●●	●●			Reduces waste material requiring off-site disposal. Reduces off-site fill requirements.	Reduces fuel use in on-site construction equipment and in trucking waste materials.
Crush existing structures to optimize scrap recovery and produce fill materials.	Medium	●	●	●			Reduces waste material requiring off-site disposal. Reduces off-site fill requirements.	Reduces fuel use in trucking waste material and fill material.
Grind waste wood and other organics for on-site use.	Medium	●	●	●			Reduces waste material requiring off-site disposal.	Reduces fuel use in trucking waste material.
Use recycled materials for fill.	High	●	●	●			Reduces virgin fill requirements.	
Routinely evaluate treatment processes for optimal performance.	High	●	●	●●●	Reduces air emissions from treatment processes.	Reduces potable water use and waste water discharge from treatment processes.	Reduces waste material requiring off-site disposal.	Reduces purchased energy use.
Capture free product or emissions for on-site energy recovery.	High	●	●	●●●	Reduces air emissions from treatment processes.	Reduces waste water discharge from treatment processes.	Reduces waste material requiring off-site disposal.	Reduces purchased energy use.
Incorporate renewable energy sources, such as wind or solar, into treatment systems.	High	●	●	●●●				Reduces purchased energy use.
Use energy efficient systems and office equipment in job trailer.	High	●	●	●				Reduces purchased energy use.



High
Medium
Low

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● indicates a benefit may reduce cost, time, or technical complexity - the number of symbols indicates the relative amount of the reduction.
● indicates a benefit may add or reduce cost, time, or technical complexity depending on the project specifics.
● indicates a benefit won't likely impact cost, time, or technical complexity.